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CHLORINE AND AIR POLLUTION:

AN ANNOTATED BIBLIOGRAPHY

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CHLORINE AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

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CHLORINE AND AIR POLLUTION: AN ANNOTATED BIBLIOGRAPHY

INTRODUCTION

This bibliography contains 162 abstracts of documents and articles on chlorine. These abstracts are numbered sequentially on their upper right corner. The number on the upper left corner is the APTIC accession number.

An author index, a title index, a subject index, and a geographical location index follow the abstracts. The author index lists all authors individually. The first author is indicated by an asterisk (*). The indexes refer to the abstracts by the number on their upper right corner.

All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Office of Air Programs, Research Triangle Park, North Carolina 27709. Readers outside the Office of Air Programs (OAP) may seek duplicates of documents directly from libraries, publishers, or authors.

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EMISSION SOURCES

06351 1

R. F. Abernathy and F. H. Gibson

RARE ELEMENTS IN COAL. (Bureau of Mines, Washington, D.C.) (Information Circular 8163). (1963). 73 pp.

Data are presented showing trends in the content of chlorine, phosphorus, titanium, and manganese although these elements are not included in the category of rare and uncommon elements in coal. It is suggested that elements may be called rare when the amount in the earth's crust is not much greater than 0.01 percent. By uncommon is meant unusual concentrations of elements greater than normally occur in the mineral matter of coal. The occurrence of 34 elements in coal is reviewed. These do not include the elements silicon, aluminum, iron, calcium, magnesium, sodium, potassium, and sulfur, which constitute the main part of the mineral matter in most coals. Some of the rare elements found in coal probably were derived from the original coal-forming plant material. Elements occuring in sufficient concentration to be detected as minerals usually are considered as extraneous substances deposited in coal beds from external sources. Three main stages of the enrichment of elements in coal are suggested: (1) Concentration during the life of the plants; (2) concentration during decay of the plants; and (3) concentration during mineralization of the coal. There are three hundred eighty (380) references.**

03129 2

Avy., A. P.

METHODS OF REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES. (CHAPTER VI. CHEMICAL INDUSTRY). European Conf. of Air Pollution, Strasburg, 1964. p. 337-356.

The pollutants discharged by the chemical industry may be subdivided into several classes. The first and most important class is that of harmful products emitted in large quantities by the "heavy" chemical industry and, in particular, organic chemical works: Sulphur dioxide, sulphuric acid, chlorine, whether manufactured or in the form of impurities in the basic material: fluorine in the case of fertilizers and fluorine again in aluminum electro-chemistry. The chemical industry has a wide range of special problems which is in a constant state of flux owing to the wide and ever-increasing variety of new synthetic products (intermediate and finished) in the organic chemical industry. From the technical point of view, the prevention of pollution by such products depends on their presentation and manner of application. A problem directly connected with chemical manufacture is that of smell: mercaptans, hydrogen phosphide, methylamines, etc., although, of course, it does not arise in the chemical industry alone. Technical methods used to reduce pollution are highly devellped for dusts and smoke and there is a wide choice of apparatus. The chemical industry, like all others, is subject to laws and regulations governing industrial air pollution. A fairly sharp distinction, however, should be drawn between laws, which lay down in general terms the objects to be attained and the obligations to be fulfilled, and the regulations which embody detailes of the limits imposed and the degree of reduction demanded. In this last report, caution is necessary and impossible or unnecessary standards should not be set. It is clear that international liaison or even international collaboration is not only desirable, but necessary.##

09275 3

Bohne, Helmut

IMMISSION DAMAGE CAUSED BY HOSPITAL WASTE INCINERATION. STAUB (English translation), 27(10):28-31, Oct. 1967. 4 refs.
CFSTI: TT 67-51408/10

The strong decolorization and whitening of plants observed in two gardening nurseries were caused by hydrogen chloride. In both cases the sources of emission were refuse incineration plants of hospitals in which chlorine compounds in the refuse, consisting 80-90 percent of paper and packaging material, were decomposed during short periods at a temperature of 800 - 1,000 deg C. Erection of chlorine washing plants appears, therefore, to be necessary. (Author's summary)##

02066 4

W. Breuer, and K. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft Und Ausbreitung Von Luftverunreinigungen, Ermittelt Durch Stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components (CO, CO2, SO2, H2S, C12, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

06298L 5

Bureau of Mines, Pittsburgh, Pa., Coal Research Center.
(1966). pp. BM/41-BM/50.

POLLUTION BY CHLORINE IN COAL COMBUSTION. (SECTION V OF AIR POLLUTION RESEARCH PROGRESS REPORT FOR QUARTER ENDED DECEMBER 31, 1966.)

The ash content in coal is undesirable. Not only is it a diluent of the coal substance, but at the temperature of coal combustion some of the more volatile components are released to contaminate the combustion products. The interest in the contribution of chlorine to contamination of flue gas has been considerably less than the sulfur compounds. It was known that high-chlorine coals when carbonized cause attack on refractories and when burned cause fouling of high-temperature heating surfaces. The chlorine content of American coals range from 0.01 to 0.5 percent, whereas English coals run as high as 1 percent. Western coals contain no chlorine; chlorine is confined to Central and Appalachian coals--closer to our large urban centers. In burning coals containing chlorine a serious pollution hazard exists. Assuming that an 800-MW power plant is burning a 0.2 percent chlorine coal, 11,000 standard cubic feet an hour of hydrogen chloride are discharged from the stack each hour or 4,560 tons each year. If chlorine in coal is a possible pollutant, the nature of the chlorine compound in the coal should be known, as well as the transformations occurring during the coal-combustion process. This information is necessary if one is to consider techniques in the removal of the chlorine content before or after combustion. The concentration of hydrogen chloride is, however, dependent upon the degree of volatilization of the sodium, from the ash, as sodium chloride.##

08631 6

CHEAPER ClO2 PROMISED BY NEW ROUTES. Can. Chem. Process., 51(3):64-66, March 1967.

Prospects for a bleached kraft mill operating on a closed chemical system have been enhanced by the latest R-2 process development, which incorporates a new reactor set-up to permit low-cost recovery of by-product sodium sulfate. The cost of chlorine dioxide relative to chlorine is the major consideration in deciding whether ClO2 will be widely applied in the chlorination(1st) stage of a bleaching sequence. Of the possible approaches to chlorine dioxide generation at the pulp-mill, two major on-site routes are the main contenders: the electrolytic route and the chlorate reduction route. It was discovered that the chloride ion effectively reduces chlorate ion to chlorine dioxide. Thus, it became possible to feed a ClO2 generator with sodium chlorate, sodium chloride, and sulfuric acid rather than the chlorate, sulfur dioxide, and the sulfuric acid. The switch also meant that R-2 plants could be lower in capital costs for a given ClO2/Cl2 tonnage. Since its first full-scale use in 1960, the R-2 process has been installed at

26 (out of 80-odd) pulpmills in North America, many of them in southern USA. These R-2 plants account for about 40 percent of ClO_2 generated for pulp bleaching. As these southern US R-2 plants became fully depreciated, the chemical cost of ClO_2 was as low as 10 cents/lb in some cases (that is, to 3.8 cents/lb of equivalent chlorine).

09785 7

Dickinson, Janet, Robert L. Chass, and W. J. Hamming

AIR CONTAMINANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 11-21, 1967.
GPO: 806-614-30

The parameters of an air pollution problem, particularly the problem in Los Angeles County; the measures taken to eliminate the problem; and control measures still needed are described. The air contaminants include: organic gases (hydrocarbons, hydrocarbon derivatives); inorganic gases (NO_x, SO_x, CO); miscellaneous inorganic gases (NH_3, H_2S, Cl_2, F_2); particulates (carbon or soot particles, metallic oxides and salts, oily or tarry droplets, acid droplets, metallic fumes). Each is discussed indicating the sources and significance in the air pollution problem.

09686 8

R. L. Duprey

COMPILATION OF AIR POLLUTANT EMISSION FACTORS. Public Health Service, Durham, N. C., National Center for Air Pollution Control, Publication No. 999-AP-42, 67p., 1968. 126 refs.

Detailed emission factors are given for the following processes and industries: fuel combustion, refuse incineration, chemicals, food and agriculture, metallurgical refining, minerals, petroleum, pulp and paper solvent evaporation and gasoline marketing, and transportation (vehicle emissions).##

02236 9

HYDROCHLORIC ACID MANUFACTURE, REPORT NO. 3. J. Air Pollution Control Assoc. 13, (10) 502-5,7, oct. 1963.(TI-2 Chemical Committee.)

This report, published as Informative Rpt. No. 3 of the Air Pollution Control Association's TI-2 Chemical Committee represents the "best thinking of the Association" on the subject. The manufacture of hydrochloric acid involves the generation of hydrogen chlorid gas and its absorption in water for the aqueous solutions. There are three principal processes used to produce hydrogen chloride: (1) Reaction of salt and H2SO4 (Mahnheim Process) resulting in the production of hydrogen chloride gas and sodium sulfate; (2) Burning chlorine in a slight excess of hydrogen; (3) As a by-product from chlorination of organic compounds. Up until the early thirties more acid was made by the salt-acid process; by 1961 the hydrogen-chlorine process was more in use. Air pollution aspects of the processes are reviewed.##

17344 10

Knop, Wilhelm

INDUSTRIAL DUSTS AND WASTE GASES. (Industriestaeube und-abgase). Text in German. Wasser Luft Betrieb, 14(1):20-23, Jan. 1970.

The major sources of dangerous and annoying industrial dusts or gaseous pollutants are enumerated. In mines, coking plants, and gas works, dusts develop at the sorting, crushing, and mixing processes. The extent of dust development depends on the water content, the grain size, and the strength of the material. Waste gas and vapor develops behind driers, transportation facilities, and in the quenching of coke. The chemical industry produces the dangerous halogen gases, of which chlorine and bromine are the most harmful. The maximum allowable long-term emission concentration for chlorine is 0.1 cu cm/cu m air; the short-term value is three times daily 0.5 cu cm/cu m air. Hydrogen chloride develops at the manufacture of dyes. The maximum allowable emission concentration for fluorine is 0.5 cu cm/cu m air. Flourine compounds (in gaseous form or dust) develop in aluminum production, fertilizer manufacture, and at the polishing stations for quartz and glass. With sulfuric acid production in a Claus furnace or in the manufacture of dyes SO2 and SO3 develop. The maximum allowable concentration for these pollutants is 0.2 cu cm/cu m air. Hydrogen sulfide has been limited to 0.1 cu cm/cu m air. It develops in refineries in dye and viscose manufacture. A particularly noxious gas is carbon monoxide which develops in phosphorus and carbide plants. Quarries, cement factories, the ceramic industry, mixers for asphalting highways, iron ore sintering plants, blast furnaces, and foundries all are large contributors of dust and gaseous emissions.

16691 11

Ladu, M., M. Pellicioni, and M. Roccella

PRODUCTION AND DISCHARGE OF TOXIC AND RADIOACTIVE GASES IN THE 'LINAC' TUNNEL IN FRASCATI. (Produzione e scarico di gas tossici e radioattivi nel tunnel del Linac di Frascati). Laboratori Nazionali di Frascati del CNEN, Italy, LNF-65/21, Nota interna: no. 282, 12p., June 28, 1965. 8 refs. Translated from

Italian. National Research Council of Canada, Ottawa, National Science Library. T.T. 1332.
CFSTI: N 69 [illegible]

Among the hazards associated with high-power linear accelerators are the production of NO_2 and O_3 plus the nuclides O 15, N 13, and Cl 38. For the sake of production and the safety of personnel, production of the gases and nuclides in the Frascati linear tunnel was calculated. Results show that the maximum allowable concentrations of the gases are reached in approximately 20 min. If the air in the tunnel is changed every 10 minutes, concentrations can be kept below the admissible levels. This can be accomplished by ventilation on the order of 60 cu m/min. Production of the nuclides is less than 20% of the allowable maximum, which for lungs is 4 rem in 13 weeks, corresponding to the value 7 to 0.011 rad/hr for 40 hrs/week. Radiation levels at points where radioactive gases are discharged do not appear to be serious.

[illegible] 12

Lindberg, Walter

AIR POLLUTION IN NORWAY. I. THE GENERAL AIR POLLUTION IN NORWEGIAN CITIES AND INDUSTRIAL TOWNS. (Den alminnelige luftforurensning i Norge. I. Generelt om luftforurensning i byer og tettbygde strøk.) Translated from Norwegian. Oslo Univ. (Norway), p. 1-69, 1968. 13 refs

General information is presented on air pollution in Norway with attention focused on (1) the sources and types of pollutants: motor vehicles, heating plants, incinerators, (2) air pollution levels in the cities, including dustfall, SO_2, and smoke measurements in Oslo, Sweden, (3) special investigations (sulfuric acid fog), the chemical composition of solid particulates in smoke and suspended dust, polynuclear hydrocarbons and particulates, trace elements, (4) pollutants in Norwegian cities other than Oslo, (5) directions for medicohygienic evaluation of pollution levels in cities and other densely populated districts and industrial regions, and (6) an evaluation of the economic consequences of air pollution.

[illegible] 13

Little (Arthur D.) Inc., Cambridge, Mass.

RESEARCH ON CHEMICAL ODORS. PART I -- ODOR THRESHOLDS FOR 53 COMMERCIAL CHEMICALS. Manufacturing Chemists Association, Washington, D.C., 24p., Oct. 1968

The odor thresholds in air of 53 industrial chemicals were determined by panel test. The odor threshold concentrations for the chemicals studied are tabulated in this report as an alphabetical listing and by increasing threshold concentrations. All concentrations are calculated as parts per million by volume. These values are reported for 50 percent and 100 percent (two and four members) panel recognition. Based on our experience in odor measurement, it is recommended that the concentrations given for 100 percent recognition should be considered as the recognition threshold values. The spread between 50 percent recognition may be indicative of the individuality of the odor type as well as the constancy of the data obtained. With 27 of the samples examined, 50 percent recognition was equal to the 100 percent recognition concentration, while in 23 instances the 50 percent recognition was once concentration interval lower than the 100 percent recognition.

19434 14

Ministry of Labour and Social Welfare, North Rhine-Westphalia, Germany

KEEPING THE AIR PURE IN NORTH RHINE-WESTPHALIA. (Reinhaltung der Luft in Nordrhein Westfalen). Congr. Reinhaltung der Luft, Duesseldorf, West Germany, 1969. (Oct. 13-17.) Translated from German. Belov and Associates, Denver, Colo., 133p., Feb. 11, 1970.

The centers of industrial concentration in North Rhine-Westphalia are also those of population concentration. The close juxtaposition of these concentrations of emittants of air pollutant material and the densely situated population causes extreme problems. The directed measures of the last ten years against the unbearable dust load and the harmful sulfur dioxide emissions have led to considerable improvements. Measurements show an extraordinary reduction of dust and SO2 in the air since 1963. While infringements on the dust limit values were found on 22% of the measurement surface at the beginning of the measurement period with 5% of the measuring surface violating the SO2 limit value, in the year 1968 violations were 5% for dust and 1% for SO2. These successes were predominantly due to severe licensing practices for new industrial plants and improvement programs for existing industries that do the most to determine emission concentrations: steel convertors, ore sintering plants, coking furnaces, foundries, and steam power plants. The experiences of the last few years have shown that the problems of air pollution are subject to change and have a continuous connection with the developments in technology and production in industry. An increase of around 25% to 5 million tons SO2 emissions per year is projected from 1967 to 1975. From 1975 on, the production of electric power, which will then account for 40% of the SO2 emissions, will be considerably influenced by atomic energy; SO2 emissions will first stop their increase and then start to decline. Fluorine, hydrocarbons, chlorine, and numerous odor substances will become the focus of attention. The dust problem will no longer be a question of loads due to coarse dust, but dangers to health due to fine dusts. Precipitation measurements will be extended to include concentration measurements. In the coming 10 years, the State will also take an increasingly critical look at emissions from automobiles and domestic heating units. The goal of the State Government is the development of a control system on a regional basis. Data banks will be set up to provide regional data on individual industrial emission sources, as a tool to the development of control programs. This program has already begun in the area of metropolitan Cologne and will soon be extended to the Duisburg/Oberhausen/Mulheim a.d. Ruhr, Essen/Bottrop, Gelsenkirchen/Wanne/Eickel/Bochum, Castrop/Rauxel, and Dortmund regions.

07957 15

Pendergrass, J. A.

AN AIR MONITORING PROGRAM IN A CHLORINE PLANT. Am. Ind. Hyg. Assoc. J., 25(5):492-495, Oct. 1964.

The industrial hygiene program conducted in a plant producing chlorine to determine the concentrations of chlorine in the work areas is described. An air sampling apparatus was developed which enabled simultaneous samples to be collected from eight locations in the chlorine unit. The apparatus consisted of an air pump, plenum chamber, eight impinger type samplers and eight rotometers to measure and control air flow. All components, except the pump, were housed in a portable plywood cabinet. Plastic tubing extended from the assembled apparatus to the sampling locations. The sampling point at each location was at head height except for one location which was about 15 feet from the floor. One 8-hour sample was collected from each location each shift. The samples were collected in 0.1N sodium hydroxide and were analyzed by a colorimetric method using o-tolidine. The results of the study indicated that the chlorine concentrations were normally below the threshold limit. AAM##

08366 16

PROGRESS IN ALKALINE PULPING--1965, The Institute of Paper Chemistry. Tappi, 49(6):1061-1101, June 1966. 264 refs.

Technical and topical literature reporting progress in alkaline pulping, abstracted in the Abstract Bulletin of The Institute of Paper Chemistry during the calendar year 1965, is reviewed. Documents from fourteen countries are included. The bibliography lists two-hundred-sixty-four references.

11369 17

Robinson, John W.

MILL EXPERIENCE WITH THE R-2 CHLORINE DIOXIDE PROCESS. Tappi, 46(2):120-123, Feb. 1963. 6 refs. (Presented at the 16th Alkaline Pulping Conference, Tech. Assoc. of the Pulp and Paper Industry, Savannah, Ga., Oct. 31 to Nov. 2, 1962).

Experience in design, startup, and operation of the first mill installation of the R-2 chlorine dioxide process is discussed.

Typical operating data, raw material consumption, and recommended optimum operating conditions are included. Results of the first year's operation (1962) indicate approximate savings over the previously existing process of $0.[illegible] per lb of chlorine dioxide produced. The R-2 process is relatively trouble free and is very easy to operate and control during startup, as well as during changes in production rate. (Author abstract modified)

[illegible] 18

Romano, A. H., and R. S. Safferman

STUDIES ON ACTINOMYCETES AND THEIR ODORS. (J. Am. Water Works Assoc.) 55(2):169-176, Feb. 1963.

A study was initiated to characterize the odoriferous materials produced by actinomycetes and to evaluate the effectiveness of various treatment procedures. Although the chemical structures of the odoriferous concentrates are yet unknown, these preliminary studies demonstrate the extreme intensity of the actinomycete odor, and also provide materials for assessing the efficiency of various water treatment methods. All evidence obtained thus far merely implicates the actinomycetes as a source of earthy odors in water supplies. Consequently, further chemical studies would be most desirable as a means of firmly establishing whether these troublesome odors are in fact due to actinomycetes. When odoriferous concentrates obtained from S. griseoluteus were treated with chlorine, no enhancement of the odor was noted; instead slight decreases in odor intensity could be shown. On other hand, activated carbon at a concentration of 10 ppm proved highly efficient in reducing the odors. Whether similar results will occur with other actinomycete groups still remains to be seen. The addition of 1ppm chlorine to spore suspensions of four different actinomycete species buffered at pH7.0 was found to be effective in preventing their development. It is conceivable then that chlorine could be of consequence in indirectly controlling actinomycete odor problems. #####

[illegible] NOT REPRODUCIBLE 19

Shera, Brian L. and Joseph P. Heitman

RELATIONSHIP OF OXIDATION-REDUCTION POTENTIAL TO FREE AVAILABLE CHLORINE IN PULP CHLORINATION. A PRACTICAL APPLICATION TO THE STUDY OF PULP CHLORINATION. Tappi, 48(2):89-96, Feb. 1965, 8 refs. (Presented at the Third International Pulp Bleaching Conference, Tech. Assoc. of the Pulp and Paper Industry, Seattle, Wash., Aug. 27-30, 1964.)

Oxidation-reduction potential (ORP) measurements and the free available chlorine determinations are of considerable use in the study of the chlorination phase. An appendix describes the analytical procedure for available free chlorine determination. Carbon tetrachloride was used to selectively dissolve and separate free available chlorine from the pulp chlorination liquor. Rapid decline in the ORP indicates that free available chlorine no longer exists and the carbon tetrachloride extraction method is used for confirmation. Pulp chlorinations at various chlorine dosages, temperatures, and retention times were analyzed. Higher chlorine dosages and/or higher temperatures alone or in combination accelerate the degradation of cellulose fibers over the same retention period. Reduced retention periods to compensate for increased temperatures at teach level of chlorine dosage will permit equivalent fiber delignification and minimize further degradation of the cellulose. (Author abstract modified)

20

19039

Stahl, Quade R.

PRELIMINARY AIR POLLUTION SURVEY OF CHLORINE GAS. A LITERATURE REVIEW. Litton Systems, Inc., Silver Spring, Md., Environmental Systems Div., NAPCA Contract PH 22-68-25, Pub. APTD 69-33, 79p., Oct. 1969. 187 refs.
   CFSTI: PB 188087

The effects, sources, abatement, and methods of analysis for pollution due to chlorine gas are reviewed, as its production has doubled in the past 10 years. Methods of analysis are available, but they are not sufficiently sensitive or selective for determining atmospheric concentrations of chlorine. Possible sources are industrial liquefication processing, other industrial uses of chlorine, and accidental leakage during storage or transportation. To prevent pollution from these sources, the emissions from these systems can often be piped to the sniff gas system or tied in directly either to a scrubber system or a high stack for dispersion. Low concentrations (3000 micrograms/cu m) can cause irritation of the eyes, nose, and throat; larger doses can cause damage to the lungs and produce pulmonary edema, pneumonitis, emphysema, or bronchitis. Chlorine gas is known to have caused injury and death to humans and animals as well as to have damaged plant life. (Author abstract modified)

21

00712

F. Wolf J.W. Jacobi

REFUSE BURNING. (MUELLVERBRENNUNG.) Brennstoff-Waerme-Kraft (Duesseldorf) 18(4):169-170, Apr. 1966.

This is an annotated bibliography on refuse burning. Fifty-seven references cover technical problems and processes, description of plants already built, new plants either being built or planned and the current state of the art in other countries of Europe and the U.S.A. Subjects treated include chlorine corrosion in refuse fires, waste burning with and without heat utilization and combinations of composting and burning. New plants in various cities in Germany with capacities of up to 360 tons per day are planned; one in Nurnberg will produce 27-34 tons per hour of steam.**

ATMOSPHERIC INTERACTION

05938 22

C. M. Gordon, and R. E. Larson

ACTIVATION ANALYSIS OF AEROSOLS (IN: NRL QUARTERLY ON NUCLEAR SCIENCE AND TECHNOLOGY). Naval Research Lab., Washington, D. C. Jan. 1, 1964. pp. 17-22.

In order to determine the background radiation from radioisotopes produced by neutron activation of elements normally present in a filter and in the atmospheric aerosols collected, the magnitudes of these backgrounds were investigated by radioactivation analysis of a series of daily samples of local atmospheric aerosols. The data obtained from these measurements indicate that background from normal atmospheric aerosols will not seriously limit the use of dispersed elements specially selected for high neutron cross sections or special nuclear properties (gold, iridium, or copper, for example) as atmospheric tracers for small scale experiments in cloud physics or aerology. Radioactivation analysis provides a valuable technique for studying the composition and concentration of the atmospheric aerosols. These isotopes, Mn56 (half-life 2.58 hours), Na24 (half-life 15 hours), and Br82 (half-life 35.8 hours), were easily measured and were selected for measurement as indicators of the quantities of these elements present in the local atmospheric aerosols.**

08439 23

NOT REPRODUCIBLE

Mrose, H.

MEASUREMENTS OF PH, AND CHEMICAL ANALYSES OF RAIN-, SNOW-, AND FOG-WATER. Tellus, 18(2):266-270, 1966. 7 refs.

Since 1957 more than 200 samples of rain water have been analysed at the Meteorological Observatory of Dresden-Wahnsdorf (51,1 degrees N, 13,7 degrees E). At four mountain summit stations and one coastal station fog water was sampled and analysed. The yearly mean of the pH has remained constant since 1958, while in western Europe Jessel found a decrease in the pH. There are no differences in the pH between summer and winter and between shower and rain. There are no differences in the concentration of chemical traces between shower and rain, the seasonal difference is unimportant. The concentration of traces including the artificial beta radioactivity in fog water is larger by one order of magnitude. It is possible to estimate the trace content of one cubic meter of air from the trace concentration of the fog water and the water content of the fog, if the fog persists for a long time. (Author's abstract)**

24

[illegible]

Petrenchuk, O. P. and V. M. Drozdova

ON THE CHEMICAL COMPOSITION OF CLOUD WATER. Tellus 18(2):280-286, 1966. 2? refs.

The chemical composition of the cloud water collected in the different regions of the USSR is considered. On the basis of their analysis and generalization the main characteristics of chemical content have been obtained. The total ion amount of cloud water is slightly different from that of atmosphere precipitation and there is a remarkable difference in their chemical composition. Subinversion clouds are peculiar filters capturing different contaminations from the atmosphere and stimulating its refinement to some extent. A great influence of industrial pollution on the chemical composition of cloud water is noted.##

25

[illegible]

Wogman, N. A., C. W. Thomas, J. A. Cooper, R. J. Engelmann, and R. W. Perkins

COSMIC RAY PRODUCED RADIONUCLIDES AS TRACERS OF ATMOSPHERIC PRECIPITATION PROCESSES. In: Pacific Northwest Laboratory Annual Report for 1966 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., Contract AT(45-1)-1830, BNWL-481-3, p. 85-87, Oct. 1967. 8 refs.
CFSTI:

The concentrations in rainwater of Cl(38), S(38), Cl(34), Cl(39), and Na(24) which are cosmic ray-produced radionuclides vary with precipitation rate. During periods of light rain with accompanying small drop sizes, the number of condensation nuclei per unit liquid volume is high, resulting in a high concentration of radionuclides. The ratios of these five radionuclides provide information on the scavenging rate and removal efficiency of the atmospheric aerosols to which they are attached, while the absolute concentrations of these radionuclides provide information on the average altitude of the air mass from which precipitation formation occurred. The wide variation observed in the ratio Cl(39) to Na(24) in the rain samples is indicative of the "in-cloud" time spent by the condensation nuclei. The lowest Cl(39) to Na(24) ratios were observed during the beginning of a rain storm while the highest ratios were observed near the end.##

NOT REPRODUCIBLE

26

[illegible]

Wogman, N. A., C. W. Thomas, J. A. Cooper, R. J. Engelmann, and R. W. Perkins

COSMIC-RAY PRODUCED RADIONUCLIDES AS TRACERS OF ATMOSPHERIC

PRECIPITATION PROCESSES. In: Pacific Northwest Laboratory Annual Report for 1966 to the USAEC Division of Biology and Medicine. Volume II: Physical Sciences. Part 2. Radiological Sciences. D. W. Pearce and M. R. Compton (eds.), Battelle Memorial Institute, Richland, Wash., Pacific Northwest Lab., Contract AT(45-1)-1830, p. 1-3, Dec. 1968. 4 refs.
CFSTI: BNWL-481-2

A technique for studying fallout rates and mechanisms, which permits the investigation of processes which cannot be studied by other methods, is discussed. Short-lived isotopes with half-lives of minutes to hours have a potential in defining the precipitation scavenging mechanisms. When highly sensitive multidimensional gamma-ray spectrometers were used, the two short-lived cosmic ray produced radionuclides C1-38 and S-38 were discovered in rain-water, and techniques for the measurements of three other short-lived radionuclides C1-34m, C1-39, and Na-24 in precipitation were developed. For their measurement the chlorine isotopes are precipitated from rainwater samples of 2 to 100 liter volumes, while the S-38 and Na-24 are contained in the residue from evaporation of the water samples. The five radionuclides are then measured by direct counting on a multidimensional gamma-ray spectrometer. The ratios of these five radionuclides provide information on the scavenging rate and removal efficiency of the atmospheric aerosols to which they are attached, while the absolute concentrations of these radionuclides provide information on the average altitude of the air mass from which precipitation formation occurred. The wide variation observed in the C1-38 to Na-24 ratio in the rain samples is indicative of the "in-cloud" time spent by the condensation nuclei. The lowest C1-38 to Na-24 ratios were observed during the beginning of a rain storm while the highest ratios were observed near the end.##

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MEASUREMENT METHODS

20790 27

Brar, S. S., D. M. Nelson, J. R. Kline, P. F. Gustafson, E. L. Kanabrocki, C. E. Moore, and D. M. Hattori

INSTRUMENTAL ANALYSIS FOR THE TRACE ELEMENTS PRESENT IN CHICAGO AREA SURFACE AIR. J. Geophys. Res., 75(15):2939-2945, May 20, 1970. 4 refs.

On April 4, 1968, surface air particulates were collected on cellulose fiber filters simultaneously at 22 different locations throughout the Chicago metropolitan area. A 1-sq cm portion of each filter was irradiated with thermal neutrons in a CP-5 research reactor. The neutron-induced nuclides were analyzed by gamma-ray spectrometry with 10.2 cm by 10.2 cm (4 in. by 4 in.) and 7.6 cm by 7.6 cm (3 in. by 3 in.) cylindrical NaI(Tl) crystals and a 400-channel analyzer. By varying the neutron flux and the time of irradiation, twenty trace elements in the surface air were detectable by purely instrumental means. The following elements, listed in decreasing order of concentration, were present: iron, chlorine, aluminum, zinc, manganese, sodium, bromine, vanadium, chromium, antimony, mercury, selenium, cerium, silver, cobalt, lanthanum, scandium, cesium, and europium. The average concentrations varied from 2400 to 0.12 mg/cu m air. Calcium concentrations in air were not quantitated. (Author abstract modified)

07180 28

W. Breuer

METROLOGY AND AIR POLLUTION. Die Messtechnik bei der Reinhaltung der Luft. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf) 107 (39), 1434-8 (Oct. 1965). Ger.

A survey of air pollution measurements is presented. In the group of emission measurements, a block diagram for continuous CO2 and SO2 measurements is given and some details of sampling and filtering are discussed. A nomograph relates the SO2 emission with the sulfur concentration of the fuel. These measurements operate on the principle of infrared absorption. Another block diagram shows examples of dust measurements. Both the electrostatically operating "Konitest" and a meter based on light extinction are employed. An electrochemical device determining chlorine is explained. Here the chlorine oxidizes iodide which in turn causes a depolarization current to flow. As an example of concentration measurements, an electrochemical device determining H2S in concentrations as low as 1 ppb is given. The electric current arising as the result of the formation of silver sulfide is of the order of 0.1 micron amp which can be amplified and recorded. A short discussion of practical aspects of sampling and statistical evaluations of results, in particular, relations to wind directions, concludes this paper.**

29

14076

Preuer, Wolfram

NEW METHODS OF CONTINUOUS TRACE ANALYSIS. (Neue Verfahren zur kontinuierlichen Spurenanalyse). Text in German. Arch. Tech. Messen, no. 396, p. 7-12, Jan. 1969. 2 refs.

A detailed description is given of two electrolytic continuous recording devices for measurement of small traces of gases present, for example, in atmospheric air. An earlier version with a liquid electrolyte was based on Nernst's concept of a concentration chain. The new version uses an organic substance as an electrolyte which has a high dielectric constant, a low electric resistivity, a low vapor pressure, is but slightly hygroscopic, and possesses a high melting point. This electrolyte is solid and is part of a monolithic, small and rugged unit. The accuracies of measurements made by these devices vary between dilutions of 10 to the minus 9th power and 0.000001, depending on the kind of gas. At present, the following gases can be determined with these accuracies: C_2, O_3, Cl_2, NO_2, NO_2 plus NO, H_2S, HCN, and $COCl_2$.

30

06352

R. P. DeGrazio and R. G. Auge

GAS CHROMATOGRAPHIC INVESTIGATIONS FOR THE DETERMINATION OF FLUORINE AND OXYGEN IN MIXTURES. Dow Chemical Co., Golden, Colo., Rocky Flats Div. (Rept. RFP-880) (Apr. 12, 1967). 10 pp.
CFSTI: RFP-880

This report describes various methods investigated for the determination of fluorine and oxygen in gas mixtures by gas chromatographic techniques. The technique found to be successful involves the quantitative conversion of fluorine to chlorine by the reaction with sodium chloride and the subsequent separation and detection of chlorine and oxygen. (Author abstract)**

31

02439

A. V. Demidov, L. A. Mokhov, and B. S. Levine (Tr.)

RAPID METHODS FOR THE DETERMINATION OF HARMFUL GASES AND VAPORS

IN THE AIR. Vol. 10 of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Medgiz, Moscow, Russia. (Technical Transl. No. TT 66-11767.) 1962. pp. 114.

Volume 10 of the survey series "U.S.S.R. Literature on Air Pollution and Related Occupational Diseases" is a translation of A. V. Demidov's and I. A. Molbov's book "Rapid Methods for the Determination of Harmful Gases and Vapors in the Air" (Vekopehhlie Metoubi Oiipeuejiehnr B B Boeuyxe Bpeuhlix N Iopooopaehlix Bowecth), published by Medgiz of Moscow in 1962. The greater part of the outlined procedures have been developed by U.S.S.R. analytical chemists, while some were taken from literature of other countries. The collection of tests appears to be intended primarily for the detection of dangerous gaseous and vaporous air pollutants in indoor working premises. For each harmful gas or vapor qualitative as well as closely approximate quantitative procedures are given to make possible the early determination of dangerous harmful gas and vapor concentration in the air of working premises and to forestall the occurrence of serious accidents. The volume was intended to meet the needs of smaller laboratories and of field industrial laboratory workers.##

03010 32

H. Devorkin, R.L. Chass, A.P. Fudurich, C.V. Kanter

SOURCE TESTING MANUAL. Los Angeles County Air Pollution Control District, Calif. 181 pp., Nov. 1965

Specialized methods and techniques for the curtailment of contaminants being released into the atmosphere, developed in the laboratory and in the field are described in this manual. These methods are concerned primarily with the measurement of emissions from stationary sources, and in general, with little or no modification, these methods can also be used for testing vehicles or other moving sources. Information obtained form source tests is invaluable as a guide in selecting appropriate control equipment and improving the design of future installations to minimize the discharge of air contaminants. Following topics are discussed: Planning a source test; Determination of gas flow rate; Collection and analysis of particulate matter, and of gaseous constituents; Odor measurement; Source test report. The appendixes deal with rules and regulations, conversion factors and constants, and auxiliary field sampling equipment.##

15632 33

Dokladalova, J. and S. Banas

SELECTIVITY OF THE DETERMINATION OF SULFUR IN ORGANIC COMPOUNDS. (Zur Selektivitaet der Schwefelbestimmung in organischem

Material). Text in German. Mikrochim. Acta, no. 4:741-748, 1969. 10 refs.

The influence of the halogens and nitrogen compounds on the combustion of a sulfur-containing sample in an empty quartz tube and on the subsequent spectrophotometric analysis of SO2 as p-rosanilinemethane sulfonic acid was studied. Combustion of the test substances and the spectrophotometric analysis were previously described in another paper, and only the modifications are described in this paper as follows: test solutions of various concentrations of halogen compounds were burned in sulfur-free dimethylphthalate, or they were burned without solvent. Standard solutions containing sulfur as well as halogens were burned. Two modifications of the standard method were made in the nitrogen test: standard solutions containing various nitrogen compounds were burned in sulfur-free dimethylphthalate. The combustion products were absorbed in 8 ml of 0.1 M Na2HgCl4; the resulting solution contained 7 micrograms of dichlorosulfitomercurate. Standard solutions which contained sulfur compounds as well as nitrogen compounds were burned. It was found that interference by the halogens depends on their absolute quantities and not on their percentage. No halogen interference was observed during the combustion; they seem to interfere only in spectrophotometric determinations. A maximum of 100 micrograms chlorine, 10 micrograms bromine, and 10 micrograms iodine may be present. Interference by nitrogen compounds depends on compound type. Some compounds change the ratio of SO2 to SO3 in the gas phase during spectrophotometry.

34

08501

Heinz Engelhardt

AUTOMATIC ANALYZER FOR THE MEASUREMENT OF GASEOUS AIR POLLUTANTS. ((Automatische Analysatoren fur die Messung gasformiger Luftverunreinigungen)). Text in German. Z. Instrumentenk. (Brunswick), 85(6):189-190, 1968.

The three principles used for measuring both the emission of gaseous pollutants from a source and their "imission" are: (1) physical methods; (2) physical methods with the aid of chemical reactions; and (3) electrochemical methods. As a purely physical measuring method the photometric principle is employed in the ultraviolet, visible or infrared wavelengths. The disadvantage of this method is lack of sensitivity and it is therefore employed mainly for emission measurements, which are a thousand to ten thousand times larger than imission measurements. The second method, which depends first on a chemical color reaction with subsequent measurements with a photometer, is more sensitive. It will measure pollutants from 1 ppm down to 0.02 ppm. Ionization detectors with or without the aid of chemical reactions are also employed to a limited extent. Several photometers and ionization detectors are described and illustrated. The electrochemical methods are the most sensitive and selective. Numerous methods are available, but so far only the conductivity and galvanic methods have been employed for imission measurements. Several analyzers are described and illustrated. The preferred automatic method of analysis with a range of the smallest measurable concentrations for the most important air contamination gases is tabulated.

10518 35

Engelhardt, Heinz

A GAS ANALYSER FOR THE MEASUREMENT OF IMPURITIES IN AIR. Instr. Review, 15(194):98-99, Feb. 1968 Translated from German, Electrotech. (B), No. 7, 1966.

A gas analyzer has been introduced which measures air impurities such as SO2, HCl, NH3, HC, NO2, CO, Cl2, and H2S. The instrument, called Picoflux, operates on an electroconductivity principle. The various air contaminants are analyzed by using different electolyte solutions in the voltaic cell; if several gases are present, preliminary filtration is also employed. The instrument is suited for measuring low concentrations: 0 to 0.1 ppm SO2; 0 to 0.5 ppm HCl and 0 to 1 ppm NH3. The range is adjustable by a factor of 2.5 or 5 with the flick of a switch. An integrating recorder allows 10- or 3 minute mean measurement readings.

01789 36

Z. Trzepke and J. Baranek

ANALYZER FOR CHLORINE CONTENT OF AIR. Analyzator Chloru v Ovzdusi. Chem. Prumysl (Prague) 16, (8) 496-7, Aug. 1966.

Several different types of galvanic cells were tested for the determination of the chlorine content of air. A platinum-silver half cell in a bromide containing electrolyte and a phosphate buffer was the most suitable. When used in a compensating amperometric circuit it yielded a current intensity proportional to the chlorine concentration in the range 0-50 ppm. Neither carbon dioxide nor nitrogen dioxide interferes to an appreciable extent. If necessary, the interfering effect of sulfur dioxide can be eliminated by preliminary washing with potassium permanganate solution. The apparatus is simple, cheap and reliable.##

16340 37

Fischer, H.

RECOMMENDATIONS FOR THE IMPROVEMENT OF THE TESTING AND EVALUATION METHODS FOR THE PERFORMANCE OF CORROSION TESTS IN THE ATMOSPHERE. (Empfehlungen zur Verbesserung der Prueftechnik und Untersuchungsmethodik bei der Durchfuehrung von Korrosionsversuchen an der Atmosphaere). Text in German. Technik (Berlin), 24(12): [illegible], Dec. 1969. 9 refs.

The site for corrosion tests must be selected according to the use of the material to be tested. Any influence by nearby buildings, trees, or bushes must be avoided. The samples should be arranged at an angle of 45 degrees to the horizontal; the surface which is to be tested must face the south. The air temperature, relative humidity, amount of precipitation, dust fall, sulfur dioxide and chlorine exposure, wind direction, wind speed, radiation intensity, duration of sunshine, the Na, K, Cl and SO4 ion concentration as well as the pH value must be measured. For the evaluation, such factors as the dust accumulation on the surface, the time of the last precipitations, and the use of a microscope to determine the degree of corrosion are of importance. Measurement of the corrosion depth was required for any accurate evaluation.

19538 38

[illegible], Walter and Peter [illegible]

DETERMINATION OF CHLORINE EMISSIONS. (Bestimmung von Chloremissionen). Text in German. Wasser Luft Betrieb, 13(3):92-95, March 1969. 8 refs.

Description and flow diagram are presented for the "Mitrometer" recording photometer for monitoring chlorine emission. The air sample is drawn into a reaction helix in which it contacts the reaction solution containing methyl orange, potassium bromide, hydrogen peroxide, and glycol. Any chlorine present in the air sample bleaches the methyl orange, while the potassium bromide accelerates this reaction and the hydrogen peroxide oxidizes any SO2 present in the air sample, thus completely eliminating any cross-sensitivity of the process to SO2. Following removal of the gas phase in a separator, the reaction solution is analyzed by an alternating-light photometer which continuously measures the extinction of the reaction solution. With a given rate of sample-air flow, the strength of the extinction is a measure of the Cl2 concentration. The measured value is amplified and transmitted to a recording device. The gas leaving the separator is used to propel the spent reaction solution into a storage tank. Details of the apparatus design, the dosage of the chemicals in the reaction solution, the measurement procedure, the calibration of the air-sampling device and of the optical and electrical subsystems, as well as the selectivity, reproducibility and sensitivity of the measuring process are specified.

80982 38

H.W. Georgii E. Weber

THE CHEMICAL COMPOSITION OF INDIVIDUAL RAINFALLS. Institut fur Meteorologie und. Geophysik, Frankfurt/M, Germany. AFCRL-TR-69-0227, July 1969. 19 pp.
CFSTI, DDC: AD [illegible]

The chemical composition of individual cases of rainfall was analyzed at 3 different sampling stations. The locations where these samples were taken showed a great variety with respect to altitude, climate and level of industrial and anthropogeneous pollution. A relation between the concentration of trace substances in rainwater and the quantity of rain was found which obeys a power law. The amount of trace substances in rainwater shows a marked increase after a preceding period of dry days. Changes in the concentration of atmospheric aerosols and trace gases caused by the effect of precipitation are described. (Author)##

C7657 40

Hesselbohm, F.

SAMPLING AND ANALYTICAL PROCEDURES USED IN CONNECTION WITH THE SWEDISH ODOR STUDIES. In: Proceedings of the International Conference on Atmospheric Emissions from Sulfate Pulping. Sanibel Island, Fla., April 28, 1966. E. R. Hendrickson (ed.). Sponsored by: Public Health Service, National Council for Stream Improvement, and University of Florida. DeLand, Fla., E. O. Painter Printing Co., ((1966)). p. 349-353.

The sampling methods and analytical procedures used in previous odor threshold studies for SO_2, H_2S, CH_3SH, $(CH_3)_2S$, and $(CH_3)_2S_2$ are described. The instability of some reagents is also dealt with.##

19759 41

Betterer, Andre and Michel Verlesier

PSEUDOCHROMATOGRAPHIC MICROANALYSIS UTILIZING GAS-SOLID EQUILIBRIA. DETERMINATION OF NO_2, $NOCl$, Cl_2, HCl, CO_2 AND H_2O. (Microanalyse pseudochromatographique utilisant les equilibres gaz-solide. Dosage de NO_2, $NOCl$, Cl_2, HCl, CO_2, H_2O). Text in French. Z. Anal. Chem., vol. 247:266-271, Oct. 1969. 12 refs.

Gas separation was carried out in two stages, condensation and sublimation, in a small metal tube exposed to a temperature gradient from 77 to 300 K. A non-condensable gas such as helium, hydrogen or nitrogen was used as a carrier. In the first stage, the components of the mixture were selectively solidified in the cooled tube under partial pressures below those of the triple points. In the second stage, heating of the tube with an inverted temperature gradient caused sublimation and completes the separation. Catharometers or mass spectrometers were employed for the detection and determination of the gases. Gases could be determined in the range of 0.000001 to 0.0001 mole/ml of gas. (Author abstract modified)

02685 42

H. Hummel

INDUSTRIAL GAS MEASUREMENT FOR CLEAN-AIR MAINTENANCE. Staub (English Translation) 25, (7) 11-18, Feb. 1965
CFSTI: TT 66-51040/2

This article deals mainly with emission-concentration measurements directly concerning the plant. In addition, trace-element recorders for immission control in the plant area or outside it was also mentioned. Several plants use mobile recording stations for this purpose. Apart from current control, immission instruments will in future be important for the determination of ground loading. The ground loading in respect to a specific noxious substance (e.g., SO_2) is a measure of the average degree of nuisance caused by immissions in a certain area. For a planned installation, e.g., a boiler plant, the ground loading for the basis for chosen location must be ascertained. This forms the basis for granting the building permit. According to suggested and practiced methods, the ground loading is established in the following manner. Numerous points are established in a fixed coordinate grid around the location to be examined. Individual sampling is carried out at these points by a fixed program over a long period. By using a precisely determined statistical evaluation method, the ground loading can be deduced from the data. The statistical character of the immission, which depends on wind and atmospheric conditions, is thus taken into consideration. The reliability of this still imperfect method cannot be discussed; it is however certain that this method is expensive and requires considerable manpower. On the other hand, it can easily be shown that given a correct evaluation of the strip charts (possibly by electronic scanning) the use of recording instruments at a few points will provide an equally reliable measure of ground loading at less expense. This method would also include the nighttime which hitherto has not been included. In spite of this, and taking into consideration the value of recording methods for obtaining statistical relationships, the role of individual analysis will remain unchallenged in future. This is primarily due to the fact that the development of a reliable recording method is far more expensive than individual analysis. Therefore, and because of the greater instrumentation requirements, recording instruments will be used only for the most important duties. (Author summary)##

12673 43

J. P. Keane, E. M. R. Fisher

ANALYSIS OF TRACE ELEMENTS IN AIR-BORNE PARTICULATES, BY NEUTRON ACTIVATION AND GAMMA-RAY SPECTROMETRY. Atmos. Environ., 2(6):603-614, Nov. 1968.

Neutron activation provides a direct method for the analysis of trace elements in airborne particulate material collected on filters. By means of gamma-ray spectrometry and utilizing computer techniques the elements sodium, manganese, chlorine, vanadium, aluminum, bromine, and possibly copper and indium may be determined simultaneously. A number of filter materials have been analysed for interfering trace elements. Teflon filters are found to have particularly low Cl2 concentration in comparison with other materials examined. The esparto grass filters currently used at the nuclear weapon fallout sampling stations operated by A.E.R.E. Harwell, have high trace impurity concentrations. Nevertheless the volume of air filtered is so large that it was found possible to carry out a series of measurements using samples from these stations. Weekly samples from Chilton (Berks.), Lerwick (Shetland), and Milford Haven (Pembs.) have been collected and analysed over periods of several months. Mean concentrations (micro g/3) at Chilton for the year April 1965 to March 1966 were Cl2 2.2, Mn 0.033, Na 0.85, Al 0.25, Br 0.080, and V 0.015. A small number of daily samples from Salford (Lancs.) indicate concentrations 2-10 times higher than those from Chilton. (Author's Abstract)**

19640 44

Klimenko, N. A. and L. G. Aleksandrova

DETERMINATION OF KARBIN IN AIR. ((Opredelenie karbina v vozdukhe.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 33(1 -3):371-374, Jan.-March 1968. 7 refs.
CFSTI: TT 68- 50449/1

In recent years "Karbin" came into extensive use as a herbicide for the control of wild oats in wheat and barley stands, and for the treatment after sprouting of flax, sugar beet, peas and beans. Its active principle is 4-chlorobutynyl-2-yl-N-chlorophenyl-carbamate ("Barbane"). In view of its toxicity for man and warm blooded animals (Voitenko et al.), the question arose of methods for its determination in air for purposes of sanitary control. Suggested methods for determining (Karbin in air were spectrophotometry (Sensitivity, 2 micrograms), and wet ignition from total chlorine (sensitivity, 5 micrograms). It is also possible to determine "Karbin" by means of thin-layer chromatography, with a sensitivity of 5 micrograms.

05078 NOT REPRODUCIBLE 45

E. R. Kuczynski

EFFECTS OF GASEOUS AIR POLLUTANTS ON THE RESPONSE OF THE THOMAS SO 2 AUTOMETER. Environ. Sci. Technol. 1, (1) 68-73, Jan. 1967.

A study was made of the quantitative response of the Thomas SO2 autometer to gases that might coexist with SO2 as air pollutants. These gases included NO2, NO, HCl, CL2, NH3 , and HF. The gas mixtures were prepared dynamically at the ppm level by a flow mixing method to a high degree of accuracy. Syringe pumps were used to add small quantities of pure gases to a large vol. air stream. The effects of NO2, NO, and HF on the SO2 reading were small, but HCl, NH3, and Cl2 gave significant responses. (Author abstract)**

46

31236

A. L. Linch, S. S. Lord, Jr., K. A. Kubitz, and M.
R. DeBrunner

PHOSGENE IN AIR - DEVELOPMENT OF IMPROVED DETECTION PROCEDURES. Am. Ind. Hyg. Assoc. J. 26, 465-73, Oct. 1965. (Presented at the 26th Annual American Industrial Hygiene Conference, Philadelphia, Pa., Apr. 27-30, 1965.)

Air-borne acids, alkalies, and halides introduced intolerable uncertainties into the hydrolysis of phosgene to acid and chloride ion in aqueous collection media. Colorimetric detectors produced reliable results in (1) liquid reagents, (2) impregnated paper, and (3) granular solids. "Ketone" (4,4'-dimethylaminobenzaldehyde in Harrison's reagent in liquid systems was sensitive to 0.1 to 10 ppm of phosgene but insensitive to SO2, H2S, HCl, NO2, or Cl2. Application of Witten and Prostak's 4-(4'-nitrobenzyl) pyridine reagent to paper delivered semiquantitative results by color comparison or gas titration. Adaptation to chlorinated solvents gave sensitivity to 0.01 ppm and a unique calibration technique. A commercial granule-filled length of stain tube further extended mobile survey facilities. (Author abstract)**

47

11042

C. L. Luke

NEW X-RAY METHOD FOR THE DETERMINATION OF TRACE ELEMENTS IN AIR. Preprint, Bell Telephone Labs., Murray Hill, N. J., ((12))p., 1968. 3 refs. (Presented at the 61st Annual Meeting, Air Pollution Control Association, St. Paul, Minn. June 23-27, 1968, Paper 68-66.)

A new accurate, sensitive and almost universally applicable X-ray method for the determination of trace elements in inorganic and organic materials has recently been developed. This method should be equally useful for the determination of trace elements such as S, Cl, Pb, Zn, Cd, As, etc. in water and air. In contrast to the problems that exist in the X-ray determination of trace elements in metals, alloys and other inorganic samples one is not confronted, in air analyses, with the difficulties that arise from absorption and enhancement effects due to the presence of large amounts of matrix elements. Instead, after a proper sampling of the air has been made the only problem that remains is to obtain the trace elements in a suitable environment so that they can be determined with the greatest accuracy and sensitivity by X-ray analysis. Tests have shown that trace elements collected from air can be obtained quantitatively on small filter paper disks for X-ray analysis by classical precipitation and filtration separations, provided that precautions are taken to insure complete precipitation by the use of a suitable coprecipitant. Since the X-ray spectrograph is a specific tool and since several elements can be determined on a single paper disk it is evident that the proposed new method will be much less time consuming than the chemical or instrumental methods heretofore used. It is seldom necessary to completely isolate the element to be determined. Suitable procedures have been developed for the separation and determination of microgram amounts of 68 of the 72 elements that are customarily determined with an X-ray spectrograph. As little as 20 nanograms of Ni, Ti, and Sc, 0.1 microgram of S, Ca, Cu, Fe, Co and Zn and 1 microgram of most of the other elements can be separated and determined. A complete analysis can be made in less than 15 minutes.##

C364C 48

METHODS FOR THE DETECTION OF TOXIC SUBSTANCES IN AIR (CHLORINE). Ministry of Labour, London, England, (Booklet No. 10) 1966. 7 pp.

This booklet is a revision of the original test for chlorine published in 1939 and revised in 1955. The recommended maximum concentration is 1 part per million parts of air or 3 mg/M3 averaged over the normal working day. This new test uses 3,3'dimethylnaphthidine as the reagent. A mauve color which develops with chlorine is compared with prepared liquid standards or commercially obtained glass standards. The test is not for chlorine as other oxidizing agents such as bromine, chlorine dioxide, and nitrogen dioxide affect the reagent. With this method only 360 ml of air are required to assess the concentration at the threshold limit value. The primary object of such tests is not to obtain a high degree of accuracy but to obtain a rapid indication of a dangerous atmosphere.##

08138 49

Polezhaev, N. G.

DETERMINATION OF ACTIVE CHLORINE IN THE AIR. In: Survey of U.S.S.R. Literature on Air pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 29-30, May 1960.
CFSTI: TT 60-21475

Existing methods for the colorimetric determination of small quantities of active chlorine using dimethyl-paraphenylene-diamine-hydrochloride possesses high sensitivity; they can be used for the determination of chlorine in the presence of hydrogen chloride in the absence of other oxidizers which produce a similar color. In such methods the chlorine is absorbed directly into a dilute solution of dimethyl-paraphenylene-diamine acidified with HCL;the reaction takes place the moment aspiration of the air begins. The color produced in the solution is not permanent; therefore, the colorimetric determination must be made without delay. Comparison is made with an artificially prepared standard scale. High chlorine concentrations partly or totally bleach out the reaction color; therefore, the following modifications were introduced. The dimethyl-paraphenylene-diamine absorber solution was replaced by a 1 percent potassium iodide solution in a 1 percent solution of sodium acetate. As the air is being aspirated through the new absorber solution the free chlorine replaces the equivalent amount of iodine. Iodine dissolved in potassium iodide produced a red color with dimethyl-paraphenylene-diamine which made possible the determination of the replaced iodine colorimetrically; the amount of iodine thus determined was then converted to its chlorine equivalent by multiplying the obtained value by 0.28.

50

17128

Saltzman, Bernard F.

PREPARATION AND ANALYSIS OF CALIBRATED LOW CONCENTRATIONS OF SIXTEEN TOXIC GASES. Anal. Chem., 33(8):1100-1112, 1961. 20 refs.

The development and testing of analytical methods for the accurate determination of low concentrations of various toxic gases are described. All-glass flow systems were preferred for the dilution of gases with purified air, since such systems avoid serious errors from surface adsorption or reaction with impurities. Several practical flow dilution systems are described and diagrammed, as well as an asbestos plug flowmeter which was found useful for metering flows varying from a few hundredths of a milliliter to a few milliliters per minute; motor-driven glass syringes can also be used for metering gas (and liquid) flows in these ranges, but have the disadvantage of intermittent operation. Rotameters are convenient for metering gas flows greater than 10 ml/min, but becuase of calibration difficulties are considered secondary rather than primary measuring devices. In an evaluation of the chemical analytical methods, it was found that many of the methods available were based on assumptions derived from studies conducted either at high gas concentrations or in liquid solutions; various difficulties are encountered when such methods are critically tested at low concentrations. The methods finally selected were first tested for sensitivity for samples of reasonable size; results consistent with both sample volume and test gas concentration; adequate absorption efficiency with the available sampling equipment; and adequate stability of reagents and final solutions. The role of sampling absorption efficiency is developed mathematically, and midget sampling equipment described. Finally, methods are given for each of the following gases: ammonia, arsine, bromine, carbon dioxide, carbon monoxide, chlorine, chlorine dioxide, ethylene oxide, hydrogen chloride, hydrogen cyanide, hydrogen fluoride, monoethanolamine, nitric oxide, nitrogen dioxide, phosgene, and stibine.

51

08136

Senderkhina, D. P.

DETERMINATION OF CHLORINATED HYDROCARBONS IN THE AIR BY THE METHOD OF MICRO-COMBUSTION. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 23-27, May 1960.
CFSTI: TT 60-21485

The method described is based on the quantitative oxidation of chlorinated hydrocarbon vapor in a combustion chamber equipped with a platinum coil heated to redness. The combustion products are then passed through an absorber solution and the ionic chlorine determined nephelometrically. With an appropriately prepared standard scale accurate determinations can be made in solutions containing 0.001 mg of chlorine in 1 ml. Control tests were made with ethylene chloride, chloroform, carbon tetrachloride and trichlorethylene. A portable apparatus for the determination of chlorinated hydrocarbons in the air by the micro-combustion method was constructed. The micro-combustion method described proved to be accurate for the determination of thousandths of a milligram of chlorine within 30 to 40 minutes. A new micro-absorber is described which assures complete absorption of products of hydrocarbon combustion. Air samples are aspirated into gas pipettes filled with a saturated solution of sodium sulfate or into vacuum gas pipettes.##

11061 52

H. W. Theones, W. Guse

LATEST STATE OF DEVELOPMENT OF INSTRUMENTS FOR THE CONTINUOUS MONITORING OF GAS EMISSIONS. Staub (English translation), 28(3):53-63, March 1968. 17 refs.
CFSTI: TT 68-50448/3

For the measuremet of gaseous emissions, testing methods using chemical analysis are used for emission control based on random sampling while automatic gas analyzers are employed for continuous concentration control. The different types of measuring instruments, their possibilities and limitations are explained, and difficulties occcurring during gas cleaning are considered. Practical experience is available which has been gained in many years during the operation of gas cleaning installations and of analysers for continous measurement of sulphur dioxide present in flue gas. (Authors' summary)##

08433 53

R. B. Tupeeva

THE DETERMINATION OF METHOXONE IN AIR. ((Metody opredeleniya metoksona v vozdukhe.)) Hyg. Sanit. (English translation of: Gigiena i Sanit.), 32(4-6):72-76, April-June 1967. 4 refs.
CFSTI: TT 67-51409/2

The optimum conditions were established for the determination of methoxone by the method of wet combustion with a mixture of sulfuric acid and potassium dichromate, followed by iodometric determination of the liberated chlorine. The sensitivity was found to be 0.080 mg methoxone in the analytical volume. A sensitive method was devised for the determination of methoxone based on its hydrolysis with concentrated sulfuric acid, with the liberation of formaldehyde, followed by the photometric determination of the latter with chromotropic acid. The sensitivity was found to be 0.010 mg in the analytical volume. The hydrolysis of methoxone with concentrated sulfuric acid in the presence of chromotropic acid provides a more sensitive and accurate method for the determination of this substance.##

09983 54

Ubl, Z.

UNIFIED METHODS FOR THE ANALYSIS OF POLLUTANTS IN THE FREE ATMOSPHERE. Acta Hygienica, No. 1, Suppl, 1966. 84p. 24 refs.

Methods for the analysis of pollutants in the air are presented with precise and complete notes dealing with procedure, apparatus, reagents, and possible problems. Procedures are given for determining the following compounds in the air: SO_2, CO, NO_2, NO_x, sulfuric acid aerosols, Cl_2, H_2S, Pb compounds, CS_2, phenol, As, F_2, NH_3, soot, Mn compounds, SiO_2, and formaldehyde. Also discussed are methods of air sampling, calibration methods, calculations, sensitivity and error in the determinations interferences from other compounds, and the principle involved in the method.

09369 55

Wilson, H. N. and G. M. Duff

INDUSTRIAL GAS ANALYSIS: A LITERATURE REVIEW. Analyst, 92(1101):723-758, Dec. 1967. 712 refs.

Analytical methods are reviewed for: permanent and inorganic gases; analysis of liquefied or pure gases; fuel gases; flue gases; motor exhaust gases; analysis of micro samples; and atmospheric pollutants. The years from 1958 to about mid-1966 were covered. In no branch of analysis is the swing towards physical methods more marked than in gas analysis. There have been no important developments of the conventional methods during the last ten years; the chief advances have been the application of galvanic methods to "trace" of certain gases, and gas chromatography. The rapid spread of the electrogalvanic methods for the "on-stream" determination of traces is also most significant. The other most noticeable feature is the vast and increasing attention being paid to atmospheric pollutants of all kinds, particularly sulphur dioxide, sulphuric acid and hydrocarbons.##

CONTROL METHODS

18169 56

AIR WASH SYSTEMS HANDLE ODOUR FROM PACKING PLANT. Mod. Power Eng., 63(6):78-79, June 1969.

Five types of treatment were used in combination in a meat packing plant to handle odor problems from the hog plant, the oil refinery, and the acidulation plant. The five systems are: Dilution - mixing large volumes of odor-free air with air requiring dilution; single stage air-wash - all exhaust air is spray-washed with chlorine; two-stage air-wash - the second stage washes the air using clear water that adsorbs the chlorine; submerged-orifice scrubber - the air is washed in a submerged state in chlorinated water; two-stage wetted-fiber air-washing system - provides more intimate contact between chlorinated water and the air. The hog plant utilizes the two-stage air-wash with a chlorine rate of 50 ppm, the refinery unit utilizes the submerged-orifice scrubber with a chlorine rate of 50 to 100 ppm, and the acidulation odors are handled by the two-stage wetted-fiber system using a Terylene filter and clear water washing to remove chlorine.

00081 57

R.T. Arnest

ATMOSPHERE CONTROL IN CLOSED SPACE ENVIRONMENT (SUBMARINE). Naval Medical Research Lab., New London, Conn., Bureau of Medicine and Surgery, (Rept. No. 367.) Dec. 14, 1961. 39 pp.
CFSTI, DDC: AD 270896

The purpose of this work was to make a general summary of the toxicological problems associated with the closed space environment of submarines and to review the current state of development of tools for measuring and removing the problem substances involved. More than twenty-five atmospheric contaminants are listed, their sources, and their maximum allowable concentrations (MAC) are given, as well as the symptoms they cause, the long-term effects; tools for measuring the amounts of contaminants present are described and methods of removal indicated, in so far as known.**

19377 58

Bacon, Raymond F. and Henry T. Hotchkiss, Jr.

RECOVERY OF SULPHUR AND IRON OXIDE. (Assignee not given.)

U. S. Pat. 1,917,789. 5p., July 11, 1933. (Appl. Feb. 26, 1930, 5 claims).

A method for recovering sulfur and iron oxide from heavy metal sulfide ores is described. The iron sulfide-bearing ore is reacted with chlorine to produce ferrous chloride and elemental sulfur at a temperature sufficient to vaporize the sulfur. The elemental sulfur is collected and condensed, and the ferrous chloride residue is heated in the presence of air to form and vaporize ferric chloride forming ferric oxide. Ferric chloride vapors are condensed to remove any inert gases or chlorine, and then hydrolyzed to form ferric oxide and hydrogen chloride. The ferric oxide will be produced in the form of a fine powder which may settle out in the reaction chamber. Hydrogen chloride is introduced into a catalytic reaction chamber containing ferric oxide which acts as a catalyst for promoting the reaction between the HCland the oxygen of the air to produce chlorine. The chlorine is returned to the process for reaction with additional iron sulfide-bearing ore.

10017 59

Bloomfield, Bernard D.

CONTROL OF GASEOUS POLLUTANTS. Heating, Piping, Air Conditioning, 40(1):195-206, Jan. 1968. 26 refs.

Control technology in relation to air pollution involves the application, singly or in combination, of tall stacks for dispersion process changes, and control equipment. Most gaseous contaminants can be controlled using the techniques of absorption, adsorption, direct flame combustion, and catalytic combustion. The theoretical principles of design and operation preclude under most circumstances the use of any of the shelf items for air pollution control purposes Good design, construction, and proper operation are the requisites of a satisfactory system. The special characteristics of a number o systems are described. A table of selected air quality standards is given for such pollutants as SOx, NOx, CO, H2S, and ozone.

07815 60

Borenstein, Murray

AIR POLLUTION CONTROL IN NON-FERROUS METALLURGICAL INDUSTRY. (THE USE OF WET SCRUBBERS). Ind. Heating, 34(10):1866, 1868, 1870, Oct. 1967.

Fumes emitted from the processes involved in the non-ferrous metallurgical industry consist of extremely fine particulate matter of submicron size. These fumes result from the heating operations, from the use of fluxes and from reduction processes, all of which produce highly corrosive emissions. Types of controls include wet-scrubbers and bag filters. A typical

Airetron installation for capturing fluoride emissions during electrolysis of aluminum ore is described; it employs 20 cyclonic air scrubbers operating at a low pressure drop of 3 in. w.g. which neutralizes gaseous fluorides at the rate of 90,000 cfm at 200-250 deg F. for a total of 1.8 million cfm of gas purified. Recovery of the metal is accomplished, in this case, by permitting it to settle out of the resulting liquid and recharging it into the furnace. In this system all solids are recovered through the recycling. In the wet-scrubbers, the fumes become highly corrosive when wetted and linings such as rubber or polyester-fiberglass must be used in their construction. Bag filters provide high cleaning efficiency and operate at relatively low power costs. However, the replacement of the filter bags themselves is a high maintenance item. The non-ferrous industry thus requires some of the most sophisticated air pollution control equipment for production of an essentially low-cost product.##

06636 61

Bureau of Mines, Washington, D.C.

AIR POLLUTION RESEARCH PROGRESS REPORT FOR THE QUARTER ENDED MARCH 31, 1968. In cooperation with the Public Health Health Service.) (Mar. 31, 1967) 87 pp.

This report covers progress on research in the folloring areas: Sulfur dioxide removal from flue gas; Removal of sulfur oxides from flue gas with manganese oxide and improved regeneration; Economic evaluation of processes for the removal of sulfur dioxide from flue gas; Characteristics and removal of pyritic sulfur from selected American coals; Pollution by chlorine in coal combustion; Flame characteristics causing air pollution; Characteristics and photochemical reactivity of vehicular emissions; Mechanisms of air pollution reactions; Effects of engine, fuel and combustion system parameters on vehicular emissions; Composition, smoke and odor of diesel exhausts.##

00552 62

P.H. Cady

A KRAFT MILL WASTE CHLORINE GAS RECOVERY SCRUBBER. Preprint. (Presented at the Second Annual Meeting, Pacific Northwest International Section, Air Pollution Control Association, Portland, Oreg., Nov. 5-6, 1964.)

Although most of the normal air contaminants around Weyerhaeuser's Kraft Pulp Mill at Everett, Washington had been removed, obnoxious waste chlorine gases occasionally produced poor working conditions. A caustic gas-recovery scrubber with appropriate ductwork was installed. This scrubber, while removing the waste gases from the atmosphere, pays for itself by the resulting formation of hypochlorite bleach liquor. (Author's abstract)##

03807L 63

THE CHLORINE OXIDATION OF SULFUR COMPOUNDS IN DILUTE AQUEOUS SOLUTION. National Council for Stream Improvement, Inc., New York City. (Atmospheric Pollution Technical Bulletin 18.) June 1963. 16 pp.

Oxidation of sulfide in aqueous solution requires between 2 and 3.8 moles of Cl2 per mole of sulfide, depending upon conditions and the fraction of the sulfide oxidized. Oxidation of all the sulfide present requires at least 2.35 moles of Cl2 per mole of sulfide. Sulfate is a major product. Complete oxidation of methyl mercaptan in neutral or acid solutions requires between 2.4 and 3.3 moles of Cl2 per mole of mercaptan. Under basic conditions, methyl mercaptan apparently reacts to form an intermediate which, in turn, appears to oxidized by Cl2 once all the mercaptan has reacted. Formation of the suspected intermediate requires some 1.5 moles of Cl2 per mole of mercaptan, but a total of about 2.6 moles of Cl2 per mole of mercaptan must be added before the first trace of excess Cl2 can be detected. All attempts to identify the products of these reactions failed--probably because the concentrations involved were below the sensitivity limits of the tests used. Oxidation of dimethyl sulfide required 1.8 moles Cl2 per mole of sulfur. Oxidation of dimethyl disulfide required 5.2 moles of Cl2 per mole of disulfide--equivalent to 2.6 moles of Cl2 per mole of sulfur. All of the Cl2 oxidations were rapid enough to be complete before iodine was added. This means that the oxidations of inorganic sulfides and mercaptans required less than one minute and oxidation of the organic sulfides took less than five minutes.**

NOT REPRODUCIBLE

04861 64

I. B. Douglass

SOME CHEMICAL ASPECTS OF KRAFT ODOR CONTROL. Preprint. (Presented at the 60th Annual Meeting, Air Pollution Control Association, Cleveland, Ohio, June 15, 1967.)

The kraft process, by which more than 60% of all wood pulp made in the U. S. is manufactured creates an air pollution problem by releasing methyl mercaptan, dimethyl sulfide and hydrogen sulfide to the atmosphere. Most of the problem is associated with the emission of gases from the digester, the direct evaporator and the recovery furnace. In this paper the chemistry involved in odor formation, in black liquor oxidation, and in the destruction of malodorous compounds by burning, chlorination and treatment with ozone will be discussed. (Author abstract)**

04790 65

G. Hausberg and W. Kleeberg

INSTALLATIONS FOR PURIFICATION OF WASTE GASES GENERATED DURING CHLORINE TREATMENT OF LIGHT METAL FOUNDRY MELTS. Abgasreinigungsanlagen fur die Chlorbehandlung von Leichtmetallschmelzen. Giesserei (Duesseldorf) 53, (5) 137-41, Mar. 3, 1966. Ger.

Four types of scrubbers for wet cleaning of waste gases, in particular from light metal foundry melts, are described. The basic problem of separation of gaseous matter, the flow rate connected with it and specific problems connected with exhaust installations, are discussed. One such installation and the technical data are discussed in detail.##

06778 NOT REPRODUCIBLE 66

(INDUSTRY AND ATMOSPHERIC POLLUTION IN GREAT BRITAIN.) Industrie et pollution atmospherique en Grande Bretagne. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr. (Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 28.)

A summary of the basis of governmental action in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the "Alkali Act" are in most cases based on "the most practical means." Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.##

00379 67

G. A. Jansen and D. F. Adams

ABSORPTION AND CHLORINE OXIDATION OF SULFUR COMPOUNDS ASSOCIATED WITH KRAFT MILL EFFLUENT GASES. Preprint. 1966.

Absorption of methyl mercaptan and H2S into aqueous solutions of Cl, NaOH, and Cl plus NaOH has been studied using a 2 in diameter absorption column packed with 1/4 in. Intalox saddles. Absorption rates were noticeably affected by chemical reactions occurring in aqueous Cl and OH media. Potentiometric methods were used to follow the reactions of mercaptan and sulfide in aqueous chlorine solutions. Mercaptan apparently was converted by aqueous Cl absorption media to dimethyl disulfide and stripped off in the effluent gas. The percentage conversion increased with increasing pH. The absorption of H_2S in aqueous Cl (pH 2 to 13) was highly pH dependent. The absorption rate increased slowly as the pH of the feed solution increased to pH 11. Sulfate was the resulting oxidation product. At pH 11, the rate of absorption dropped slightly, then rose sharply at pH 12. Elemental S became the major product at pH 12 and above and fouling of the packed column occurred. The effect of pH on formation of sulfate and/or elemental S in chlorine-sulfide reactions was explained by Choppin and Faulkenberry (1937). The absorption of sulfide in aqueous NaOH increased until the feed hydroxide to sulfide ratio was 1. At higher ratios, the absorption rate remained constant. Apparently, sodium bisulfide was the absorption product. The results of these studies indicate that aqueous Cl solutions at pH above 12 can be effectively used for removal of H_2S in absorption equipment designed to handle S in suspension. The absorption of methyl mercaptan in aqueous Cl solution appeared to be impractical since dimethyl disulfide was apparently the only product formed and was stripped from the tower by the gas stream. Hydroxide solution was effective for absorption of both methyl mercaptan and H_2S when hydroxide to sulfide or mercaptan feed ratios were greater than 1 or 1.8 respectively. (Author)**

01436 68

G. A. Jensen, D. F. Adams, and H. Stern

ABSORPTION OF HYDROGEN SULFIDE AND METHYL MERCAPTAN FROM DILUTE GAS MIXTURES. J. Air Pollution Control Assoc., 16(5):248-253, May 1966.

The absorption of hydrogen sulfide and methyl mercaptan by aqueous solutions of chlorine, sodium hydroxide, and chlorine plus sodium hydroxide was studied using a two-inch diameter absorption column packed with 1/4 inch Intalox saddles. Absorption rates were noticeably affected by chemical reactions occurring in the aqueous chlorine and hydroxide media. These solutions were studied as a means of controlling sulfur-containing gas emissions from kraft paper mills. The absorption studies indicated that aqueous chlorine solutions at a pH above 12 were effective absorbents for hydrogen sulfide removal in absorption equipment designed to tolerate sulfur in suspension. The absorption of methyl mercaptan in aqueous chlorine solutions appeared to be impractical since dimethyl disulfide was apparently the only product formed and was stripped from the tower by the gas stream. Sodium hydroxide solution was an effective absorbent for both methyl mercaptan and hydrogen sulfide when hydroxide to sulfide or mercaptan feed ratios were greater than 1 or 1.8, respectively. The mercaptan absorption coefficient was approximately twice that for sulfide absorption. (Author abstract)**

10308 69

Robert K. Koppe, and Donald F. Adams

GAS-PHASE CHLORINATION OF KRAFT PULP MILL GASES. TAPPI, 51(5) 193-195, May 1968. 12 refs.

Gas-phase chlorination of gases from kraft pulp mills appears to be of limited value as a means of odor reduction. In laboratory experiments, gas samples from the recovery furnace, batch digester, multiple-effect evaporator, and lime kiln of a mill were charged with known volumes of chlorine gas and the reactions were recorded by gas chromatography. The chlorine oxidized the methyl mercaptan in the gases to dimethyl disulfide but did not change the concentrations of hydrogen sulfide or dimethyl sulfide in the samples. Complete elimination of the methyl mercaptan apparently is possible if adequate chlorine doses are added. However, the odor reduction effected in the total gaseous effluent would probably not be sufficient to justify use of this process on a plant scale. (Authors' Abstract##

16501 70

Leone, P.

RECOVERY AND USE OF SULFUR DIOXIDE IN THE SULFUR EXTRACTION PROCESS. (Ricupero ed utilizzazione dell'anidride solforosa nel processo di estrazione dello zolfo). Text in Italian. Ann. Chim. (Rome), 21:238-244, 1931. 5 refs.

A procedure is proposed for converting sulfur-bearing gases into hydrochloric acid and chlorine gas by passing the sulfur dioxide over sodium chloride heated to 450-500 deg. The context of the proposal is directed toward the island of Sicily in the early 1930's, where the production of sulfuric acid from SO2 is considered unprofitable, and from where the cost of transporting such products as calcium sulfite and calcium bisulfite is considered prohibitive. Two chemical reactions are involved: sodium chloride, sulfur dioxide, water, and oxygen react to form sodium sulfate and hydrochloric acid; and sodium chloride, sulfur dioxide, and oxygen react to form sodium sulfate and chlorine gas. Both reactions are strongly exothermic. The HCl is to be used in dissolving limestone gangue; the Na2SO4, to enrich minerals with sulfur by way of increasing their sulfur yield; and Cl gas, in the manufacture of calcium chloride.

07884L 71

M. Lew, R. Woodruff, W. Johnson, W. Musa

ION EXCHANGERS IN REMOVAL OF AIR CONTAMINANTS. San Francisco Bay-Naval Shipyard, Vallejo, Calif., Chemical Lab.-8024-66, PP-1, ((30))p., March 1967. ((50)) refs.
DDC: AD 808060L

The ability of ion exchangers to be synthesized, modified, regenerated, or used in customary form to react with gaseous air contaminants and effect removal of these contaminants from air was studied. Results show that treated and untreated ion exchangers will react with a variety of gaseous materials and thereby cause removal of these materials from air. Reactions which occur between ion exchange resins and ionized reactants in aqueous media will likely occur in gaseous systems. The possibilities of reactions between exchangers and organic contaminants at nominal temperatures cannot necessarily be foreseen. Favorable reactions between organic vapors and exchanged groups on ion exchange resins are being sought.##

19570 72

Likmanova, T. L., and Ya. Ye. Vil'nyanskiy

SOLUBILITY OF CERTAIN GASES IN METAL CHLORIDE MELTS. (Rastvorimost' nekotorykh gazov v rasplave khloridov metallov). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim. i. Khim. Tekhnol., 9(4):537-540, 1966. 8 refs.

Solubilities of chlorine, hydrogen chloride, carbon monoxide, and carbon dioxide in molten anhydrous carnallite were studied from 500-900 C with gas partial pressures of 0.30-1.02 atm. Solubility of chlorine and carbon dioxide was found to be approximately equal to the partial pressure raised to some temperature-dependent power, times an empirical constant. Solubility of hydrogen chloride and carbon monoxide was found to follow the Henry law. Solubility increases with temperature for chlorine, carbon monoxide, and carbon disulfide, but decreases for hydrogen chloride. Heat of solubility in the anhydrous carnallite melt of the 500-900 C range is (cal/mole): Cl2, 3640; CO2, 3700; CO, 6560.

00131 73

H. F. Lund (Ed.)

INDUSTRIAL AIR POLLUTION. Factory 123, (10) 90-101, Oct. 1965.

A review of industrial air pollution problems and their solution is presented. The effectiveness of federal, state and local efforts on this problem, as well as the steps that industry has taken to control it, are discussed. Recommendations include: education of the public, a national planning program supported by industry, federal and state governments, federal legislation, less costly and more effective equipment for containing and preventing the nuisances.##

NOT REPRODUCIBLE

08162 74

Matsak, V. G.

THE PURIFICATION OF AIR POLLUTED BY VAPORS AND GASES. In: Survey of U. S. S. R. Literature from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, 177-185, May 1960.
CFSTI: TT 60-21475

Methods for the recovery and purification of noxious substances ejected by gas exhaust and ventilating installations are reviewed. It was found easier to purify exhaust gases than ventilating air. The methods include: Chemical purification method, Condensation method, Liquid absorption method, and Absorption by solid absorbents (adsorption). Present methods for air and gas purification can be rendered close to 100 percent free of most acid and alkali gases, organic solvent vapors and some other gases. But no effective and cheap method has been found up to the present for the recovery of carbon monoxide. Purification of air from solvent vapors, such as gasoline, acetone, acetates, etc. can be used effectively only in the case of tail gases and not in the purification of ventilating air, even though it is effective in both instances; the high cost makes its use for purification of ventilation air economically prohibitive. The possibility of using solid absorbents, such as activated charcoal and silicagel for the purification of ventilation air may apply to many cases. The primary obstacle lies in the high cost of adsorbent material and in the consumption of considerable electric energy in overcoming the pressure drop of recuperating installations.

12527 75

Morrison, J. L.

RECOVERY SCRUBBER FOR WASTE CHLORINE GAS. Tappi, 51(12):124A-125A, Dec. 1968. (Presented at the 5th Water and Air Conference of the Technical Association of the Pulp and Paper Industry, Portland, Oregon, April 1-4, 1968.)

Equipment was installed in a kraft mill bleach plant to combine and scrub waste gas discharges containing chlorine. Scrubbing was done with a 4% caustic solution. The scrubber, while improving atmospheric conditions, pays for itself by recovering 96% of the waste chlorine as hypochlorite bleach liquor. (Author's abstract)
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15693 76

Mukai, Shigeru, Yuriko Araki, Masaharu Konishi, and Keiichiro Otomura

DESULPHURIZATION OF COAL WITH SOME OXIDIZING REAGENTS (I).

DESULPHURIZATION BY THE TREATMENT WITH CHLORINE GAS AND HYDROGEN PEROXIDE. (Sankazai ni yoru sekitan no datsuryu (I). Enso gasu oyobi kasankasuiso sui ni yoru datsuru). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 48(512):905-911, Dec. 20, 1969. 4 refs.

Desulfurization of coal has been investigated for many years, but no methods have been developed for industrial use. They have been studied mainly in the process of carbonization. The desulfurization method was examined at room temperature before carbonization. The conventional coal preparation technique is insufficient to reduce the sulfur content of bituminous coal, which has a high sulfur content. Desulfurization of Oshima and Ikeshima mine coals by chlorine treatment was attempted. Coal particles were suspended in water, and chlorine gas was introduced into this suspension for 0.5-6 hours. The sulfur content of Oshima mine coal containing 2.16% of sulfur decreased to 1.22%; the sulfur content of Ikeshima mine coal containing 2.58% of sulfur decreased to 1.82%. The desulfurization rate of Oshima mine coal was 42% and Ikeshima mine coal, 30%. The elimination rate of inorganic sulfur of Oshima mine coal was 95% and Ikeshima mine coal, 70%. Inorganic sulfur in coal is practically eliminated by treating with chlorine. Reduction of organic sulfur of Oshima mine coal was 13% and Ikeshima mine coal, 20%. After carbonizing the coal treated with chlorine, the sulfur content of Oshima mine coal became 0.8% and Ikeshima mine coal, 1.2%. The total desulfurization rate of Oshima mine coal was 63% and Ikeshima mine coal, 53%. Unfortunately, however, the coal treated with chlorine gas showed an unfavorable effect on the caking property. This difficulty was solved to some extent by adding some amounts of pitch to the chlorine-treated coal. Desulfurization by treating with the aqueous solution of 3% hydrogen peroxide was also examined. Coal particles were suspended in the aqueous solution of hydrogen peroxide. Desulfurization rate of Yotsuyama mine coal was about 30% and Akabira mine coal, about 30%. Inorganic sulfur was practically eliminated. Caking property did not decrease by treating with hydrogen peroxide.

77

04887L

National Council for Stream Improvement, New York City.

ABSORPTION OF ODOROUS SULFUR COMPOUNDS IN CHLORINE AND CAUSTIC SOLUTIONS. (Atmospheric Pollution Technical Bulletin No. 23.) Mar. 1965. 23 pp.

The data reported herein cover the complete study on the utility of NaOH and acidic and basic C12 solutions as absorbents for odor producing sulfur compounds associated with kraft pulp mills. Absorption of H2S and CH3SH into aqueous solution of C12, NaOH, and C12 plus sodium NaOH was studied using a 2" diameter absorption column packed with 1/4" Intalox saddles. Absorption rates were noticeably affected by chemical reactions occurring in aqueous C12 and hydroxide media. Potentiometric titration methods were used to follow the reactions of C12

CH3SH, (CH3)2 S2, (CH3)2S in aqueous C12 solutions. The final product of C12 oxidation of H2S in aqueous solution is sulfate or collodial sulfur and sulfate. The sulfur-sulfate production ratio requires between 1.5 and 4 moles of C12 per mole of sulfide oxidized depending upon pH. CH3SH reacts with one mole of C12 forming (CH3)2S2 as a stable intermediate product. Continued C12 addition to aqueous acid systems results in formation of a second intermediate, probably dimethyl disulfoxide, and a final product sulfonyl chloride. In basic soltuion only disulfide is formed by the C12-mercaptan reaction. (CH3)2S forms sulfoxide upon reaction with C12 and further reactions do not appear to occur. The results of the absorption studies indicate that aqueous C12 solutions at a pH above 12 are effective absorbents for H2S removal in absorption equipment designed to handle sulfur in suspension. The absorption of CH3SH in aqueous C12 solution appeared to be impractical since (CH3)S2 was apparently the only product formed and was stripped from the tower by the gas stream. Hydroxide solution was an effective absorbent for both CH3SH and H2)s when hydroxide to sulfide or mercaptan feed ratios were greater than 1 or 1.8 respectively, and mercaptan absorption rate was twice that for sulfide absorption. (Author summary)##

18145 78

NEW GAS SCRUBBER REMOVES 0.1 MICRON DUST. Filtration Separation (Purley), 6(3):308, May-June 1969.

Peabody Ltd. has developed a high-efficiency scrubber which, when fitted with the new venturi agglomerating slot storage, removes gas, dust, and fume down to the 0.1-micron range. The scrubber recovers 99% of all particulate matter down to 1 micron with minimum pressure loss. It also provides a simple and effective means of gas absorption. Such contaminants as SO2, HC1, and C12 are readily removable.

02939 79

K. Oleksynowa

CHEMICAL CHARACTERISTICS OF WASTE CEMENT DUSTS AND THEIR VALUE FOR AGRICULTURE. (Charakterystyka chemiczna cementowych pytow odlotowych i ich wartosc dla rolnictwa.) Cement, Wapno, Gips 11/20, (3)62-4, 1955.
CFSTI: 60-21233

Waste dust from cement works was analyzed. The material was obtained on electrofilters when purifying waste gas from clinker kilns in one of the larger Polish cement plants. This material, a waste product in cement burning, has long been an object of interest on account of its high potassium oxide content. The raw material introduced into cement kilns contains barely 0.2 to 1.2% K_2O. In the course of burning the cement, a large part of the finest fraction is carried off by air current, and the aluminum silicates contained in the crude clay substance undergo thermal decomposition. At high temperatures, the liberated K_2O sublimates, combine with anions freed during thermal decomposition of the raw material. In this way, potassium chlorides, fluorides and silicates of various composition are formed. The dust analyzed in the present work contained fairly large quantities of carbonates, so that it was a typical blend of dust. From the analysis it was established: (1) Some 72% of the substance including total K is soluble in water and 2% citric acid, as is the major part of the Ca and half the SiO_2; (2) K, Na and Ca pass into water solution in the form of sulfates, chlorides and carbonates; (3) Ca, Fe and K cations pass into citric acid solution together with silicate, carbonate and sulfate anions; and (4) that cement dust can be used as a fertilizer. It primarily contains compounds soluble in water and 2% citric acid, especially K and Ca.##

04883 80

Petrova, N. I., and Zh. V. Pokrovenko

METHODS OF REDUCING AIR POLLUTION DUE TO WASTE PRODUCTS FROM NIKITOVKA MERCURY WORKS. ((K voprosu ob umen'shenii zagryazneniya vozdukha vybrosami Nikitovskogo rtutnogo zavoda.)) Hyg. Sanit. (Gigiena i Sanit.), 30(1):74-77, Jan. 1965. Translated from Russian.
CFSTI: TT 66-51033

The pollution of air by mercury vapor depends on the total quantity of the furnace gases; trapping the mercury vapor in condensation systems; hermetic sealing of the equipment and of the gas flues; and special purification of gases before their discharge into the atmosphere. The most efficient method of preventing the pollution of the atmosphere by mercury vapor is by improving technological processes in the plant. For example, since the quantity of exhaust gas increases if the ore has a higher moisture content, it is important to keep this moisture content within the technical specifications for plants operating tubular and retort furnaces. The most complete condensation of mercury vapor reduces the amount of [illegible] in the exhaust gases to 50% and less. Such condensation is achieved by improving the performance of the condensation systems and by spraying the gas with water in scrubbers, or in the final compartment of the condensers. The furnace gases were purified by spraying with water in the retort furnace shop and by the use of the pyrolusite and selective [illegible] methods in the tubular furnace shop. Gases from the retort furnaces containing between [illegible] and [illegible] mg/m3 mercury pass through two packed scrubbers sprayed with [illegible] water before being discharged into the atmosphere. The concentration of mercury vapor is reduced by nearly [illegible] on the average.##

08366 B1

PROGRESS IN ALKALINE PULPING--1965. The Institute of Paper Chemistry. Tappi, 49(6):108A-120A, June 1966. 264 refs.

Technical and topical literature reporting progress in alkaline pulping, abstracted in the Abstract Buleetin of The Institute of Paper Chemistry during the calendar year 1965, is reviewed. Documents from fourteen countries are included. The bibliography lists tw-hundred-sixty-four references.

08388 B2

Sheppard, Stanton V.

CONTROL OF NOXIOUS GASEOUS EMISSIONS. Proc. MECAR Symp., New Developments in Air Pollution Control, Metropolitan Engineers Council on Air Resources, New York City, p. 21-28, Oct. 23, 1967. 3 refs.

Several new developments have taken place which have helped improve scrubber designs for controlling emission of noxious gases. Some major new technical developments have been: Greater use of the crossflow scrubber design principle, availability of light weight plastic tower packings, and wider acceptance of corrosion resistant glass reinforced polyester plastics. Some noxious gases commonly encountered are oxides of nitrogen, hydrogen chloride, hydrogen fluoride, silicon tetrafluoride, chlorine, chlorine dioxide, sulfur dioxide, hydrogen sulfide and mercaptans. In industrial applications, the removal of noxious gases from exhaust air streams is most often accomplished by bringing the air stream into contact with a liquid stream for a certain period of time. The amount of time required to transfer the noxious gas to the liquid is a function of several factors. These are: Gas rate, liquid rate, solubility of gas, mechanism of contact, and scrubber type. The packed scrubber is used most often today for controlling emission of noxious gases to the atmosphere. It is available in three basic operating designs: Counter current, cocurrent and crossflow. In the counter current packed design, the air stream containing the noxious gases is passed vertically upward in opposite direction to the flow of the down coming scrubbing liquid. The cocurrent packed scrubber allows the air stream and the scrubbing liquid stream to pass through the packed bed in the same direction. In the cross-flow scrubber the air stream moves horizontally through the packed bed while the scrubbing liquid moves vertically downward through the packed bed and perpendicular to the air streams. Three relatively new tower packing shapes are being used more frequently by engineers in designing scrubber equipment for removing gases. These packing materials are constructed of high density polyethylene or polypropylene. This gives them good resistance to corrosion and light weight compared to ceramic ring and saddle packing. Fiber reinforced plastics (commonly designated as FRP) are being used more and more to replace stainless steel, rubber and PVC lined steel and other metallic alloys for scrubber bodies. FRP is a material that uses a combination of polyester or epoxy thermosetting resins and glass fiber reinforcements to give a finished laminate that has excellent corrosion resistance, a high strength to weight ratio, and light weight.##

09729 83

STABILIZED CHLORINE DIOXIDE FOR ODOR CONTROL. Public works, 99 (4):166, April 1968.

When a blower in the wastewater treatment plant in Phillipsburg, New Jersey, failed during the summer, the superintendent arranged for addition of stabilized aqueous chlorine dioxide. This commercially available product was added to the aeration tank effluent by a simple petcock arrangement on the drum, and a drip feed. Odors began to diminish rapidly and were under control by the next day. Addition of the chlorine dioxide continued for the next 41 days at the rate of 1.1 mg./1. This product can be activated by the reduction of pH, by the presence of free residual chlorine in the water, or by the addition of small amounts of sodium hypochlorite.##

[illegible] 84

A.C. Stern

PRESENT STATUS OF ATMOSPHERIC POLLUTION IN THE UNITED STATES. Am. J. Public Health (Presented at the 86th Annual Meeting, American Public Health Association, St. Louis, Mo., Oct. 29, 1958.) 57 (3) [illegible], Mar. 1960

The status of air pollution in the United States is reviewed in terms of knowledge available and action taken to deal with this problem. Studies by the National Air Sampling Network, state, and local health agencies are reviewed. Facilities for training persons for air pollution work are discussed, and the Federal Air Pollution Engineering Research and Technical Assistance Program is surveyed. (Author abstract)##

[illegible] 85

G.F. [illegible]

[illegible] IN AN INDUSTRIAL ATMOSPHERE. [illegible]. (Presented at the [illegible] Annual Meeting, [illegible]

Pollution Control Association, Detroit, Mich., June 9-13, 1963, Paper No. 63-86.)

The reason and methods of procedure for a protective coating testing program are discussed. Results based on fifteen years operation of such a program in a chemical plant on the Gulf Coast are described - some in detail. Atmospheric contaminants from high humidity and moisture condensation to chlorine and hydrochloric acid were encountered. A method for calibrating the atmosphere is outlined. Differences in the performance of several generic types of coating resins are presented. Generous references to the literature are included. (Author abstract)##

02562 86

A.T. Vulikh, Yu.A. Shivandronov, M.K. Zagorskaya,
V.L. Bogatyrev

FILTERING GAS MASKS CONTAINING ION-EXCHANGE RESINS.
(Fil'truyushchii ionitovyi protivogaz.) Hyg. Sanit. 31, (3) 413-6, Mar. 1966.
CFSTI: TT66-51160/1-3

The absorption by ion-exchange resins of the following gases mixed with air was tested for a wide range of concentrations and gas velocities: ammonia, amines (H-form of the cation-exchange resin KU-2), sulfur dioxide, chlorine hydrochloric acid (hydroxyl and carbonate forms of the anion-exchange resins AV-17 and EDE-10P).##

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EFFECTS - HUMAN HEALTH

06048 **87**

M. C. Battigelli, F. Hengstenberg, R. J. Mannella, and A. P. Thomas

MUCOCILIARY ACTIVITY. Arch. Environ. Health 12(4):460-466 (April 1966). (Presented at the 30th Annual Meeting, Industrial Hygiene Foundation, Pittsburgh, Pa., Oct. 20-21, 1965.)

The mucociliary activity of respiratory epithelia, although well known over many years, has only quite recently assumed new importance, being recognized as one of the basic functions that the respiratory apparatus applies in responding to unfavorable environments. Physical, chemical, and biological "noxae" have been studied in their effects on the mucociliary activity of lower animals, mammals, and in man as well, with techniques that have proved accurate and reproducible. In this paper a brief review is given of these methods and of the results of investigations particularly related to the effects of air pollutants. Results of investigations on the effect of diluted diesel exhaust on the tracheal escalator of rats are summarized. An important finding is that exhaust dilutions that are without measurable effect on the respiratory resistance of human subjects are actually able to induce changes in tracheal clearance in some of the animals exposed for prolonged duration. With higher levels of exposure tracheal clearance of small animals is affected with greater frequency. The removal of animals from the exposure invariably restores the original level of activity within a few days. The particulate content of the exhaust appears to play an important role in this type of respiratory injury. (Authors' summary)##

02247 **88**

P.K. Das, P.S. Sinha, R.K. Srivastava, A.K. Sanyal

STUDIES ON CILIARY MOVEMENT. PART II. EFFECTS OF CERTAIN PHYSICAL AND CHEMICAL FACTORS ON CILIARY MOVEMENT IN FROG'S OESOPHAGUS. Arch. Intern. Pharmacodyn. 153, (2) 367-78, Feb. 1965.

The effects of some physical and chemical factors viz. atmospheric temperature and seasonal variations, osmotic pressure, hydrogen ion concentration, some cations and anions, have been studied on one type of ciliated epithelium concerning the oesophagus of a frog. All experiments were designed so that only one factor remains variable keeping all others constant.##

11366 89

V.K. Efimova

THE HYGIENIC EFFECT OF AVERAGE TWENTY-FOUR HOUR ALLOWABLE CONCENTRATIONS OF CHLORINE AND HYDROCHLORIDE GASES SIMULTANEOUSLY PRESENT IN ATMOSPHERIC AIR. In: Maximum Permissible Concentrations of Atmospheric Pollutants, Book 8, V. A. Ryazanov and M. S. Gol'dberg (eds.), Translated from Russian by B. S. Levine, U. S. S. R. Literature on Air Pollution and Related Occupational Diseases, Vol. 15, pp.82-85, 1968. ((16)) refs.
CFSTI: PB 179140

The health effects of simultaneously present chlorine and hydrochloride gases in atmospheric air was studied experimentally with guinea pigs. Chronic exposure of guinea pigs to the inhalation of air containing simultaneously chlorine gas in 0.1 mg/cu m concentrations had no substantial effect on the general condition, weight, blood composition, and bone marrow hemopoiesis of the experimental guinea pigs. No changes suggestive of induced pathology were found in the organs of any of the experimental guinea pigs belonging either to the control or experimental groups. It is recommended that the previously adopted limits of allowable 0.03 mg/cu m of chlorine gas and 0.015 mg/cu m of hydrochloride gas should be retained without any revision.##

05076 90

B. G. Ferris, Jr., W. A. Burgess, and J. Worcester

PREVALENCE OF CHRONIC RESPIRATORY DISEASE IN A PULP MILL AND A PAPER MILL IN THE UNITED STATES. Brit. J. Ind. Med. (London) 24, (1) 26-37, Jan. 1967.

A sample of 147 men drawn from the workers in a pulp mill was compared with one of 124 men from a paper mill. The former included those exposed to chlorine and to sulphur dioxide. No significant differences were found in respiratory symptoms or in simple test of ventilatory function in the two samples, but men working in chlorine had a somewhat poorer respiratory function and more shortness of breath than those working in sulphur dioxide. The working population of both mills together had a lower prevalence of respiratory disease than that of the male population of Berlin, N.H., previously studied, suggesting that working populations may not be representative of the general population. Further, a low prevalence of disease in a working population exposed to pollutants may not indicate their 'safety' in general populations.##

07162 91

B. G. Ferris, Jr. and N. R. Frank

AIR POLLUTION AND DISEASE. Anesthesiology 25(4):470-478 Aug. 1964.

Atmospheric pollution can be classified under three headings: general, occupational and personal. The components are complex and variable so that it is difficult to extrapolate the prevalence of disease in one area to that of another unless the two have similar chemical compositions. Significant exposures can occur at work and may produce impairment of respiratory function. It is emphasized that tobacco smoking, and particularly cigarette smoking, is a most important factor in the causation of chronic nonspecific respiratory disease. Much research has been done to elucidate the mechanism whereby such changes are induced but specific answers concerning the mechanisms have not been forthcoming. Tables are included showing types of atmospheric pollution; comparison of Los Angeles and London types of pollution; categories of airborne materials with selected examples that may occur in industry and that may cause disease; age standardized rates of respiratory diseases by tobacco usage and sex; age standardized rates (%) of respiratory disease by current cigarette smoking habits and sex.##

08054 92

Gross, Paul, William E. Rinehart, and Robert T. P. deTreville

THE PULMONARY REACTIONS TO TOXIC GASES. Am. Ind. Hyg. Assoc. J., 28(4):315-321, July-Aug. 1967. 8 refs. (Presented at the Annual Meeting, American Industrial Hygiene Assoc., Chicago, Ill., May 1-15, 1967.)

The deep pulmonary response to toxic gases depends upon which of the two components of the alveolar wall is responding, the capillary or the alveolar membrane. Injury to the capillary results in pulmonary edema or bronchopneumonia, whereas a dose of irritant injuring substantially only the alveolar membrane causes the latter to respond with the development of a multi-layered cell mass that is supported by argyrophilic fibers. Because collagenization of this stroma does not usually occur, such septal lesions caused by noxious gases resolve. The respiratory bronchiole is the site of predilection of lesions caused by deep lung irritants because of delayed clearance in this region. (Authors' abstract)##

06981 93

R. A. Kehoe

AIR POLLUTION AND COMMUNITY HEALTH. Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949. pp. [illegible]

The nature and extent of the effects of industrial air pollutants upon health are matters for speculation. The facts that can be brought to bear upon the subject are derived from three principal sources. The first source is the literature of industrial toxicology, industrial medicine, and industrial hygiene. It may be generalized that a systematic study of the composition of the atmosphere of working places and concurrent clinical study of relevant groups of workmen has yielded the most pertinent information available as to the effects of specific industrial products upon health. The second source of information is the occurrence of air pollution episodes; each of these incidents, in so far as they have been subjected to investigation has yielded information. A third source of information has been that of the statistical correlation of trends in the incidence of carious diseases, with trends in atmospheric pollution. The apparently significant and relevant facts derived from these three sources are discussed.##

03221 94

G. Muki.

CLINICAL AND EXPERIMENTAL STUDIES ON SO2 POISONING. PART I. SERUM CONCENTRATIONS OF CL, NA, K AND CA IN REFINERS AT THE MATSUO SULFUR MINE. Japan J. Ind. Health (Tokyo) 3, (1) 11-5, Jan. 1961

This paper reports on the following study: chronic SO2 poisoning occurs in sulfur mine refiners exposed to contaminated air (440-2500 ppm SO2, 0-3 ppm H2S) for about 2 hours during work. Serum Cl and serum Na increased proportionately to the number of years worked (e.g., after 20 years serum Na was 113.1% of the control group). Serum K decreased proportionately to the number of years worked (94.8% of controls in 20 year group). Serum Ca did not vary markedly. These findings were found to resemble closely those of adrenal hyperfunction and were presumed to result from the consumption of Na in neutralizing and detoxifying the SO2, SO3, H2SO3, H2SO4, etc. produced in the body through inhalation of SO2 having stimulated and accelerated adrenal function, leading to promotion of the kidney's ability to reabsorb Na.##

11281 95

E. M. Roth, W. H. Teichner, and A. O. Mirarchi

CONTAMINANTS STANDARDS. (SECTION 13.) In: Compendium of Human Responses to the Aerospace Environment, Volume III, Sections 10-16, Emanuel M. Roth (ed.), Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., CONTRACT NASr-115, p. 1-115, Nov. 1968. 233 refs.
CFSTI: NASA CR-1205(III)

Toxicological problems in space operations cover those situations: (1) the acute, short term, high-level exposure either in ground support or space cabin conditions; (2) the 8-hour work day exposure found in manufacturing and ground support situations; and (3) continuous, long term exposure to trace contaminants, such as would be anticipated in extended space missions. In view of the necessity for provisional limits of manned space flights of 90 to 1000 days duration the following criteria for trace contaminant control in manned spacecraft have been derived: Contaminants must not produce significant adverse changes in the physiological, biochemical, or mental stability of the crew. The spacecraft environment must not contribute to a performance decrement of the crew that will endanger mission objectives. The spacecraft environment must not interfere with physical or biological experiments nor with medical monitoring. Based on these criteria air quality standards for prolonged manned missions have been established. The following topics are discussed: kinetics of contaminants in space cabins; toxicological factors; toxicology in the spacecraft environment; source of contaminants; particulates and aerosols; microbial contaminants. Tables presenting chemical analysis of all contaminants with standard levels for space cabins are listed.##

01916 **96**

V. A. Rjazanov.

CRITERIA AND METHODS FOR ESTABLISHIHG MAXIMUM PERMISSIBLE CONCENTRATIONS OF AIR POLLUTION. Bull. World Health Organ. (Geneva) 32, 389-98, 1965.

Experience in the USSR in establishing standards for air pollution control is described. It is emphasized that health considerations must be main criterion in deciding permissible concentrations, which constitute the "hygienic" standards ultimately to be achieved. Economic and technological reasons may dictate temporary "sanitary" standards, which modify the requirements for a limited period. "Technological" standards relate to the economic and technological consequences of air pollution and do not concern health. The maximum permissible concentrations of toxic substances used in toxicology and industrial hygiene are not sufficiently stringent for general use, and control standards are therefore based on the results of tests carried out on animals and human subjects. Tests on animals show that certain concentrations of toxic substances cause functional changes (e.g., in higher nervous activity, cholinesterase activity, and excretion of coproporphyrin) as well as a number of protective adaptational reactions. The results are used to establish maximum permissible concentrations of pollutants within a 24-hour period. Tests on human volunteers provide a basis for determining the maximum average concentrations at a given time. Reactions to odorous substances give the olfactory threshold and the level of concentration causing respiratory and visual reflexes, as well as subsensory effects such as changes in light sensitivity and in the activity of the cerebral cortex. Morbidity statistics also provide evidence of harmful pollution, but cannot serve as a basis for establishing maximum permissible concentrations, which should aim not only at preventing illness but also at avoiding pathological and adaptational reactions. (Author abstract)##

97

05946

Stayzhkin, V. M.

HYGIENIC DETERMINATION OF LIMITS OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HYDROCHLORIDE GASES SIMULATENOUSLY PRESENT IN ATMOSPHERIC AIR. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9, pp. 55-61. (1962). Russ. (Tr.)

This study was confined to the use of low concentrations of chlorine and hydrochloride gases and their effect on the physiological reactivity of man. The methods of investigation were: determination of threshold odor perception, optical chronaxy and adaptometry. Results of this investigation indicated that 0.75 mg/cu m was the concentration of threshold chlorine odor perception, and 0.02 mg/cu m the concentration of threshold hydrochloride gas odor perception. The simultaneous presence in the air of chlorine and hydrochloride gases was not odor perceptible when the gases co-existed in the following ratio concentrations: 0.3 mg/cu m of chlorine and 0.1 mg/cu m of hydrochloride gas, also 0.2 mg/cu m of chlorine and 0.13 mg/cu m hydrochloride gas. The additive physiological and neurological effects of simultaneously present chlorine and hydrochloric gases in the air were in the nature of arithmetical summation. Optical chronaxy tests indicated that threshold reflex effects were produced by chlorine and hydrochloride gas simultaneously present in the air in the following ratio combinations: chlorine, 0.3 mg/cu m and hydrochloride gas, 0.3 mg/cu m and also chlorine, 0.3 mg/cu m and hydrochloride gas, 0.3 mg/cu m. Tests of eye sensitivity to light indicated that the combination of 0.2 mg/cu m of chlorine and 0.1 mg/cu m of hydrochlorinde gas constituted a threshold combination mixture of the 2 gases which elicited changes in eye sensitivity to light. The present investigation also indicated that the previously adopted limits of allowable single chlorine concentration of 0.1 mg/cu m and of hydrochloride gas of 0.005 mg/cu m simultaneously present in atmospheric air were below the threshold of odor perception and of effect on reflex activity.

98

21078

Styazhkin, V. M.

EXPERIMENTAL BASIS FOR THE DETERMINATION OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HCl GAS SIMULTANEOUSLY PRESENT IN ATMOSPHERIC AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:158-164, 1963. (B. S. Levine, ed.)
CFSTI: 63-11570

An experimental basis for the determination of allowable concentrations for simultaneously present chlorine and HCl gas in the ambient air was obtained. Studies were conducted in the vicinity of a magnesium plant at 300, 500, 800, 1000, 2000, and 3000 m from the plant. Air samples were collected by the aspiration method through an absorber equipped with a porous plate No. 1. One absorber was filled with double distilled water; the other was filled with an acidified solution of methyl orange. Air samples collected through double distilled water were used for the determination of HCl aerosol by the titration method. Sulfuric acid, which interferred with analysis, was determined nephelometrically and subtracted from the titration result. Chlorine was determined colorimetrically in the sample. Results showed that chlorine and HCl gas concentrations were considerably in excess of the allowable maximal single concentration limit at all collecting points. The threshold of Cl odor preception was 0.7 mg/cu m and of HCl gas, 0.2 mg/cu m. Threshold odor perceptions of Cl and HCl gas simultaneously present in the air were established in the following combinations: 0.3 mg/cu m Cl, 0.1 mg/cu m and 0.2 mg/cu m Cl, 0.13 mg/cu m HCl. Results of the tests by the optical chronaxy method established the threshold of reflex effect of Cl and HCl gas simultaneously present in the air in the following concentration: 0.3 mg/cu m Cl, 0.2 mg/cu m HCl and 0.2 mg/cu m Cl, 0.3 mg/cu m HCl. The limit of maximal single concentration for Cl was 0.1 mg/cu m and for HCl, 0.05 mg/cu m. The simultaneous presence of Cl and HCl gas in the air in corresponding concentrations had no effect on the control curve of dark adaptation. Results showed that the concentrations were below the threshold of odor perception and reflex effect and below the allowable concentration limit.

08152 90

Takhirov, M. T.

DETERMINATION OF LIMITS OF ALLOWABLE CONCENTRATION OF CHLORINE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 119-125, May 1960
CFSTI: TT 60-21475

Studies of air in the vicinity of an industrial chemical plant indicated that the air in the proximity of the plant was regularly polluted with chlorine. A study of the air of Moscow indicated that the atmospheric air was polluted with chlorine even at considerable distances from sources of pollution. To threshold of Cl odor perceptibility of odor-sensitive persons was at the 0.8 mg/cu m level. The threshold of Cl effect on the reflex sensitivity of the eye to light coincided with the threshold of odor perception. The Cl threshold effect on reflex activity as manifested by changes in rhythm and amplitude of respiratory movements was at the 1.5 mg/cu m Cl concentration level, which coincided with the level established by the chronaxymetric method. The limit of allowable concentration of Cl (0.1 mg.cu m) adopted by the U. S. S. R. for atmospheric air of inhabited localities is below the threshold of Cl odor perception and also below the level of its reflex effect via the receptors of the upper parts of the respiratory tract. The maximal daily average concentration of free Cl in the air of central Moscow was 0.036 mg/cu m, which is slightly above the recommended level of 0.03 mg/cu m. This clearly indicates that the Moscow air can not admit any additional Cl discharges and that the construction of new industrial plants which discharge chlorine into the atmospheric air should be prohibited.

plate No. 1. One absorber was filled with double distilled water; the other was filled with an acidified solution of methyl orange. Air samples collected through double distilled water were used for the determination of HCl aerosol by the titration method. Sulfuric acid, which interferred with analysis, was determined nephelometrically and subtracted from the titration result. Chlorine was determined colorimetrically in the sample. Results showed that chlorine and HCl gas concentrations were considerably in excess of the allowable maximal single concentration limit at all collecting points. The threshold of Cl odor preception was 0.7 mg/cu m and of HCl gas, 0.2 mg/cu m. Threshold odor perceptions of Cl and HCl gas simultaneously present in the air were established in the following combinations: 0.3 mg/cu m Cl, 0.1 mg/cu m and 0.2 mg/cu m Cl, 0.13 mg/cu m HCl. Results of the tests by the optical chronaxy method established the threshold of reflex effect of Cl and HCl gas simultaneously present in the air in the following concentration: 0.3 mg/cu m Cl, 0.2 mg/cu m HCl and 0.2 mg/cu m Cl, 0.3 mg/cu m HCl. The limit of maximal single concentration for Cl was 0.1 mg/cu m and for HCl, 0.05 mg/cu m. The simultaneous presence of Cl and HCl gas in the air in corresponding concentrations had no effect on the control curve of dark adaptation. Results showed that the concentrations were below the threshold of odor perception and reflex effect and below the allowable concentration limit.

08152

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Takhirov, M. T.

DETERMINATION OF LIMITS OF ALLOWABLE CONCENTRATION OF CHLORINE IN ATMOSPHERIC AIR. In: Survey of U. S. S. R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 119-125, May 1960
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concentrations of SO_2 of 150 p.p.m. and bwlow, but were much more susceptible at 300 p.p.m. and 1000 p.p.m., indicating a difference in the slope of the dosage-time curves of the two species. At high concentrations of H_2S there was violent activity and loss of muscular coordination very similar to that seen with HCN; at progressively lower concentrations there was progressively less activity. In addition in the lower concentrations there was evidence of irritation of eyes and nose and of pulmonary edema increasing with time of exposure. Exposure to NH_3 caused only very slight irritation to eyes and nose. With SO_2 the signs qualitatively resembled those of Cl_2. Study of the organs at death revealed that the rats exposed to Cl_2 showed much edema and slight to moderate hemorrhage of the lungs while the mice showed somewhat less edema and more hemorrhage, the hemorrhage probably causing death in the smaller animal before the edema was fully developed. The heart was more dilated in rats than in mice. The organs of the rodents dying in HCN showed no change of importance except a bright red color of

07138 102

Yanysheva, N. Ya.

THE EFFECT OF ATMOSPHERIC AIR POLLUTION BY DISCHARGES FROM ELECTRIC POWER PLANTS AND CHEMICAL COMBINES ON THE HEALTH OF NEARBY INHABITANTS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 1:98-104, Jan. 1960. (Also published in Gigiena i Sanit., (8):15-20, 1957.) Translated from Russian.
CFSTI: TT 60-21049

A study was made of the effect of industrial discharges on the health of inhabitants of a large industrial center the atmospheric air of which was being polluted by the discharges of several production and manufacturing plants. A study was made of the degree of atmospheric air pollution with dust (fly ash), SO_2, sulfuric acid aerosol, hydrogen sulfide, chlorine, nitrogen oxides, and phenol. Air samples were collected by the aspiration method under the smoke plume coming from smoke stacks at distances ranging from 200 to 2,500 meters from a chemical combine and an electric power plant, and up to 800 meters from a phenol producing plant. The morbidity rate in two villages in the industrial area and one village in a control area was studied. Pollution of the atmospheric air with dust (fly ash), sulfurous gas, hydrogen sulfide in concentrations many times above the allowable limits and of aerosols of sulfuric acid and chlorine in concentrations just above the allowable limits, as well as the oxides of nitrogen and phenol within the limits of allowable concentrations deleteriously affected the population's health. It was concluded that the above mentioned pollutants produced the following pathologic results: a) Increased by several times the frequency of occurrence among children and adults of diseases of the respiratory organs, of the nervous system, of the organs of vision and of the skin. b) Lowered the resistance of the population to such infectious disease as the grippe and angina. c) Induced in children a state of susceptibility to the development of rickets and anemia, and brought about early manifestations of diffuse pneumosclerosis in isolated cases.##

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04673

103

L. V. Barton

TOXICITY OF AMMONIA, CHLORINE, HYDROGEN CYANIDE, HYDROGEN SULPHIDE, AND SULPHUR DIOXIDE GASES. IV. SEEDS. Contrib. Boyce Thompson Inst. 11, (5) 357-63, Dec. 1940.

Moist and dry seeds of radish and rye were exposed to a continuous flow of HCN, J2S, NH3, Cl2, and SO2 gases in concentrations of 1000 and 250 parts per million for periods of 1, 4, 15, 60, 240, and 960 minutes. Soaked seeds - Moist seeds were much more sensitive to these gases than dry seeds. Delay in germination due to treatment was the principal effect noted. This delay was sometimes accompanied by reduction in germination percentage and in some instances all the seeds were killed. Hydrogen cyanide and hydrogen sulphide had no effect on germination percentage, but delayed the appearance of seedlings under some conditions. Ammonia and chlorine were more toxic while sulphur dioxide proved most toxic under the conditions of this experiment. A possible stimulatory effect on speed of germination was noted after exposure for one minute to 250 p.p.m. of hydrogen cyanide and either 1000 or 250 p.p.m. of ammonia. Further experiments are needed to confirm this. A bleaching effect was evident after the 960-minute exposure of soaked seeds to 1000 or 250 p.p.m. of chlorine and after exposures of 60 minutes or longer to 1000 or 250 p.p.m. of sulphur dioxide. Dry seeds - In no case did exposure of dry seeds of radish to the above gases cause reduction in germination percentage . However, such a reduction did result when dry rye seeds were exposed for 960 minutes to chlorine or sulphur dioxide. Delay in germination was evidenced after exposure of dry seeds of both radish and rye to one or more of the longer periods in all gases except hydrogen sulphide. (Author summary)##

05586

104

H. M. Benedict and W. H. Breen

THE USE OF WEEDS AS A MEANS OF EVALUATING VEGETATION DAMAGE CAUSED BY AIR POLLUTION. Proc. Natl. Air Pollution Symp., 3rd, Pasadena, Calif., 177-90 (1955)

This paper presents the results of fumigations of ten species of weeds which occur more or less commonly throughout the United States, by ammonia, chlorine, hydrogen fluoride, hydrogen sulfide, oxides of nitrogen, and sulfur dioxide. Plants of two different ages and growing under two conditions of available soil moisture were fumigated at two concentrations of each compound. The results are recorded as (1) descriptions and photographs of the markings which were produced on each weed by each fumigant; (2) relative resistance of the various weeds to each fumigant. By using these two types of information it is believed that, in an area where air pollution may be causing markings on vegetation, observation of the markings on some of these weeds will lead to identification of the pollutant and consequently determination of the area over which it is spreading in concentrations sufficiently high to mark vegetation. (Author summary)**

01337 105

E. Brennan, I. A. Leone, and R. H. Daines

CHLORINE AS A PHYTOTOXIC AIR POLLUTANT. Intern. J. Air Water Pollution (London), No. 9:791-797, Dec. 1965.

The effect of various concentrations of chlorine in the atmosphere was observed on a wide range of plant species in an experimental chamber. Plants varied in sensitivity to the gas and in symptom expression following exposure to a toxic dose. Foliage bleaching and necrosis were the most common responses. When plants were exposed to chlorine under conditions of water stress the extent of injury was reduced. Also, prolonged darkness following a chlorine exposure period appeared to reduce the amount of foliar damage. Plants did not accumulate chloride in the tissues following a chlorine exposure. (Author abstract)**

01800 106

R.H. Daines, I.A. Leone, E. Brennan

AIR POLLUTION AS IT AFFECTS AGRICULTURE IN NEW JERSEY. Rutgers - The The State Univ., New Brunswick, N.J., Agricultural Experiment Station. (Bulletin 794).

Plant damage in New Jersey from sulfur dioxide, hydrogen fluoride, herbicides, ozone, and from oxidants other than ozone is discussed. Relevant literature is reviewed.**

05420 107

Daines, R. H., I. A. Leon, and E. Brennan

AIR POLLUTION AND PLANT RESPONSE IN THE NORTHEASTERN UNITED STATES. In: Agriculture and the Quality of Our Environment. Brady, N. C. (ed.), American Association for the Advancement of Science, Washington, D. C. AAAS-Pub-85, p. 11-31, 1967. 56 refs. (Presented at the 133rd Meeting, American Association for the Advancement of Science, Washington, D. C. Dec. 1966.)

A review of pollutants that have been found to elicit plant response is confined to the discussion of acid gases, primary products of combustion, and products of reactions occurring in the atmosphere. Other topics discussed include: plant response as an indicator of meteorological conditions and the fuels used for heat, light, and power.##

03849 108

E. F. Darley

STUDIES ON THE EFFECTS OF THE DUST FROM A CEMENT FURNACE. Studi Sugli Effetti Della Polvere di Cemento da Fornace. Fumi Polveri (Milan) 6, (1)) 274-81, Oct. 1966. Text in It.

Experiments were made in Germany on the effects of powder (or dust) from cement furnaces on the leaves of green beans. The leaves were sprayed with powder (from 0.6 - 3.8 g/sq m) for a period of 8 hr. The spraying was done for 2-3 days. Humidity was increased in the area of the leaves during the major part of the experiment. The method used for applying the powder allowed only the finest particles to be deposited on the plants. Later it was established that most of the particles were less than 10 micron in diameter. The criterion for determining the effect of the powder was by comparing the rate of exchange of CO_2, or the apparent photosynthesis, between the leaves that were covered with dust and those that were not. All three powders used in this experiment (the powders containing varying amounts of SiO_2, Al_2O_3, TiO_2, P_2O_5, Fe_2O_3, Mn_2O_3, CaO, MgO, SO_3, S, K_2O, Na_2O, Cl, CO_2, C, H_2O) reduced the rate of exchange of CO_2 and in most cases this was reduced by more than 30%. One of the powders caused considerable damage to the leaves, probably because KCl was present in a high concentration. The powders differed considerably in their chemical composition, in particular in Ca, K, and sulfates, and since the chemical composition varies with the size of the particle, the reciprocal action of composition and size and the rate of deposit, require an accurate investigation.##

06326 109

W. W. Heck, L. S. Bird, M. E. Bloodworth, W. J. Clark, D. P. Darling, and M. B. Porter

ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS. Texas Agricultural and Mechanical Research Foundation, College Station. Apr. 1962, 120 pp. (Rept. MRL-TDR-62-38.)
CFSTI, DDC: AD 282984

The effects of 21 missile fuel components on aquatic organisms, soil microflora, plants and soils were determined. Goldfish and Daphnia were subjected to 0,1,10,100 and 1000 ppm of the test compounds for 72 hours in the aquatic studies. Some or all of 10 goldfish and 13 Daphnia died, when exposed to 100 ppm of the test chemicals. Counts of bacteria, actinomycetes, and fungi in the soil microflora studies showed no significant decrease in any of the organisms with a 100 ppm application of test chemical to the soil samples. Three of the chemicals may sterilize the soil of actinomycetes. Plant studies were threefold using squash, soybean, cotton, cowpea and corn; germination studies using 1000 ppm of each test chemical produced consistent inhibition of germination by two of the compounds and two ionic species; seedling studies using a soil drench of each test chemical at 100 ppm, produced toxic symptoms with three of the ionic components; seedling studies using three test chemicals (gases) at 100 ppm as air pollutants produced severe injury to death of all species with each of the test gases. Soil studies (1000 ppm) included the leachability and runoff potential of each test chemical as well as the effects on soil. (Author abstract)##

21691 110

Heck, Walter H., Robert H. Daines, and Ibrahim J. Hindawi

OTHER PHYTOTOXIC POLLUTANTS. In: Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Jay S. Jacobson and A. Clyde Hill (eds.), Pittsburgh, Pa., Air Pollution Control Assoc., 1970, p. F1-F24. 54 refs.

The effects of several phytotoxic pollutants are considered. Ethylene acts as a growth hormone; it causes a reduction in growth, stimulates lateral growth, and decreased apical dominance. Plant leaves may develop epinasty or show chlorosis, necrosis, or abscission. Injury from oxidants other than ozone, PAN, or nitrogen dioxide may be chronic or acute. These oxidants, none of which have been identified, may cause necrosis, collapse of leaf tissue, and dehydrated and bleached lesions. Cotton leaves affected by herbicides show a yellow-green mottling or stippling and vein clearing may be pronounced. Tomatoes may show epinasty and twisting of plant parts. Arsenic trioxide injury on sensitive fruit and vegetable crops produces necrotic spots on the leaves, petioles, twigs, and fruits. Mild to severe interveinal necrosis and chlorosis may occur on broad-leaved plants as a result of atrazine. Necrosis, chlorosis, and epinasty are the common symptoms of chlorine injury. Acute tissue collapse and necrotic spotting have resulted from ammonia injury. Discoloration of peach and apple fruits have also been reported. Hydrogen chloride caused an acid-type necrosis. Tipburn to fir needles and necrosis along leaf margins have also been noted after HCl exposures. Mercury causes chlorosis, abscission of older leaves, growth reduction, and general poor growth and development. The effects of particulates, hydrogen sulfide, and carbon monoxide are briefly discussed.

12042 111

Heggestad, H. E.

DISEASES OF CROPS AND ORNAMENTAL PLANTS INCITED BY AIR POLLUTANTS. Phytopathology, 58:1089-1097, Aug. 1968. 80 ref.

Air pollution injury to crop and ornamental plants is increasing in the U.S.A. Estimates of annual losses to agriculture from air pollutants, which ranged from $150 to $500 million during the decade 1951-1960, are now $500 million. Although most of the loss is due to growth suppression or chronic injury, it is the acute injury that suggests the nature of the air pollutant and reveals the distribution of the problem. Each pollutant tends to produce its own pattern of injury, leaving graphic records of air pollution episodes. Photochemical oxidants, ethylene, sulfur dioxide, fluoride, and other pollutants produce marked reactions in various types of plants. The recent developments and current research trends in the assessment of these reactions are reviewed.##

04693 112

S. E. A. McCallan and C. Setterstrom

TOXICITY OF AMMONIA, CHLORINE, HYDROGEN CYANIDE, HYDROGEN SULPHIDE, AND SULPHUR DIOXIDE GASES. I. GENERAL METHODS AND CORRELATIONS. Contrib. Boyce Thompson Inst. 11, (5) 325-30, Dec. 1940.

A series of cooperative tests were conducted in which a survey was made of the relative toxicity of five common industrial gases to various forms of plant and animal life. The apparatus employed permitted a continuous flow of the gas at definite concentrations. It is believed that this is the first survey attempted under such conditions. The gases studied - ammonia, chlorine, hydrogen cyanide, hydrogen sulphide, and sulphur dioxide - were selected because of their chemical properties, physiological action, and their occurrence in industrial atmospheres. The organisms were chosen to give a wide range of behavior in the hope that a broader picture of the mechanism of toxic action might result. A total of 18 different species were studied, including plant and animal pathogenic fungi and bacteria, green plants, seeds, insects, and rodents. In some cases a given species was studied under different conditions, or in different forms of organs. The order of sensitivity of classes of organisms was as follows: ammonia - leaves greater than stems, fungi and bacteria greater than seeds and sclerotia, animals; chlorine - leaves greater than fungi and bacteria, stems, animals greater than seeds and sclerotia; hydrogen cyanide - animals greater than leaves, stems greater than fungi and bacteria, seeds and sclerotia; hydrogen sulphide - animals greater than leaves, stems greater than fungi and bacteria, seeds and sclerotia; sulphur dioxide - leaves, fungi and bacteria; greater than stems, animals, seeds and sclerotia. Details of the studies on the various organisms appear in subsequent papers.**

113

21189

Shikenjo, Norinsho Sanshi

AIR POLLUTION AND SERICULTURE. (Taikiosen to yosan-sogo shoroku). Text in Japanese. Sanshi Shikensho Shiryo (J. Sericultural Experiment Station), no. 20:102p., April 1966. 518 refs.

Various types of sericulture damage by atmospheric pollutants are considered in terms of responsible sources, in addition to the effects of the pollutants on mulberry leaves and silk worms. Damages are classified as follows: (1) sericulture damage due to gaseous, solid, and liquid wastes, the major contaminants of which are sulfur dioxide, hydrogen fluoride gas, chlorine gas, smoke dusts, and aerosols; (2) damage due to stack smokes generated by charcoal burning, heavy-oil burning, the skyrocket type of fireworks, and rubber-tire burning; (3) damage due to motor vehicle exhaust gas, dust clouds, mud, and mire; (4) damage due to aerially sprayed agricultural chemicals; (5) damage due to irradiated substances; (6) damage due to volcanic ashes; (7) damage due to salt-containing sea wind; (8) and damage due to hazardous substances, such as nicotine, contained in tobacco plants cultivated on adjacent farms or to other hazardous plants and crops such as pyrethrum, Picrasima quassioides Benn, bindweed, and peppermint. A bibilography is provided in which references are classified according to specific sources and their respective effects on both mulberry trees and silkworms.

114

16385

Takehara, Hideo

EFFECTS OF AIR POLLUTION ON PLANTS. Preprint, no source given, 4p., 1968 (?).

Current and recommended future research studies by Japanese investigators on the effects of air pollution on plants are reviewed. Local universities and agricultural research stations are emphasizing studies of the possible damage caused by sulfur dioxide, hydrogen fluoride, chlorine, and chromium from industrial sources to farm crops, tea, fruit, forest and mulberry trees, and young silkworms. Systematic basic research is being carried out by national research institutes on such problems as the symptoms and mechanism of injury to crops exposed to HF, and on atmospheric diffusion phenomena; a program is also in the planning stages to study nationally the effects of pollutants on the flowering and fruiting of plants near factories and power stations and in urban green belts. A number of subjects are proposed for high priority in future research planning: these include chronic damage to plants from long-term, low-concentration exposure to pollution as opposed to the more readily known acute symptoms; effects of such pollutants as ozone, nitrogen compounds, and ethylene; improvement of the methodology of field observations and gas chamber tests; the variables in the plants themselves that affect their susceptibility to damage; control methods, including fertilizer improvements, planting and cultivation methods, and shading; selection of smoke-resistant species of various plants; and a listing of indicator plants in urban environments.

03395 115

M.D. Thomas

EFFECTS OF AIR POLLUTION ON PLANTS. World Health Organ. Monograph Ser. 46 (Air Pollution), 1961. pp. 233-78.

The literature on the effects of air pollution on plants has been reviewed with special reference to those pollutants that present major problems - viz., SO2, HF, London type smog, and Los Angeles type smog. The others, which are definitely of minor importance, are referred to more briefly. SO2 has long been recognized as an air pollutant because it arises from the combustion of nearly all fuels, especially coal, and from the roasting of sulfide ores. It is phytotoxic in concentrations above 0.1 x 0.2 p.p.m., depending on the length of exposure. Below about 0.4 p.p.m., the gas tends to be oxidized in the cells as rapidly as it is absorbed, and interference with functions such as photosynthesis is slight. Toxic concentrations of sulfate are finally accumulated. Chronic rather than acute injury, if any, is generally manifested with these small concentrations. Above about 0.4 p.p.m., acute injury occurs more frequently, owing to the reducing properties of sulfate in the cells. Temporary interference with photosynthesis or "invisible injury" can occur to some extent, but these concentrations cause acute injury if maintained for more than short periods, and recovery is rapid when the fumigation is stopped. HF behaves somewhat similarly to SO2, except that with a few species of plants it is effective in causing lesions and interfering with photosynthesis in concentrations 2 or 3 orders of magnitude smaller than in the case of SO2. With most species it is up to 10 times as effective as SO2. Fluoride accumulated in the cells in sublethal amounts interferes with photosynthesis as does sulfite, but whereas the latter is deactivated by simple oxidation to sulfate, the former must be removed by translocation, volatilization, or some obscure chemical reaction, which makes much slower the recovery of the plant functions after HF fumigation. There appears to be a concentration of HF for each species below which "invisible injury" does not occur. The Los Angeles type smog is fairly well understood as to its mode of formation and its phytotoxic effects, but the actual compounds that cause these effects are still unknown. The smog causes characteristic leaf lesions which are quite different from those produced by other pollutants, including ozone, which may be a constituent of the smog. It also causes some "invisible" injury. Visible damage to crops in Southern and Northern California was estimated at over $5 000 000 and $1 100 000 respectively, annually, in 1956. (Author summary modified)**

00301 116

M. D. Thomas

GAS DAMAGE TO PLANTS. Ann. Rev. Plant Physiol. 2, 293-322, 1951.

A detailed review is given of gas damage to plants with references containing important bibliographies. Investigations on the effects on vegetation of sulfur dioxide, other sulfur-containing gases, halogens and hydrogen halides, nitrogen oxides, ammonia, mercury vapor, and carbon compounds are cited and results discussed. Phytotoxicities of the different gases seem to depend on (a) absorbability, which is related to water solubility and reactivity with the tissues; (b) acidity or alkalinity; (c) oxidation or reduction reactions; (d) hormonal properties; and (e) toxicity of the element itself. Carbon monoxide, hydrogen cyanide and hydrogen sulfide are of comparatively low toxicity. Greater toxicity is evidenced by chlorine and sulfur dioxide due to their rapid oxidizing or reducing properties. The even greater toxicity of fluorine and iodine compounds is due to their rapid absorption and inherent toxicity as elements in themselves.**

04725 117

Thornton, N. C. and C. Setterstrom

TOXICITY OF AMMONIA, CHLORINE, HYDROGEN CYANIDE, HYDROGEN SULPHIDE, AND SULPHUR DIOXIDE GASES. III. Green Plants. Contrib. Boyce Thompson Inst. 11, (5) 343-56, Dec. 1940.

To study; the toxicity of various gases to plant tissue, tomato, buckwheat and tobacco were exposed to a continuous flow of controlled concentrations of gaseous NH3, Cl2, HCN, H2S, and SO2. The tomato was selected as the principal test plant and was exposed for periods of 1, 4, 15, 60, 240, and 960 minutes to concentrations of 1, 4, 16, 63, 250, and 1000 p.p.m. of each of the gases. The buckwheat and tobacco were used only to determine degree and type of injury at the higher concentrations.

The order of toxicity of the gases to the leaves and the order of effect of the gases on pH of tomato leaves was in descending order: Cl2, SO2, NH3, HCN, and H2S. Acidification of the leaf tissue was brought about by treatment with Cl2, SO2, HCN, and H2S. The pH of the stem tissue was lowered by treatment with 1000 p.p.m. of gas for 960 minutes as follows: Cl2 0.9; SO2 0.7; HCN 1.0; and H2S 0.1. One thousand p.p.m. of NH3 caused an increase in pH of the leaf tissue as follows: 0.8 in one minute, 2.0 in four minutes, and 3.1 in 960 minutes; and of the stem tissue as follows: 0.1 in one minute, 0.2 in four minutes, and 3.6 in 960 minutes. Preliminary tests were made to determine the area of the plant at which initial and maximum pH changes took place. Tomato plants held in sunlight were found to give greater changes in pH with Cl2 and SO2 treatments than when held in darkness. Other gases -NH3, HCN, and H2S-were equally effective in either light or darkness. Only with NH3-treated plants was there any indication of a recovery toward normal in the pH of the plants upon standing in the greenhouse following treatment. Only NH3, Cl2, and SO2 were found to have an effect upon the pH of the soil in which the plants were growing. Visible injury to plants was observed to correlate with the effectiveness of Cl2, SO2, NH3, and H2S in bringing about a change in the pH. With HCN the resulting injury to the plant was always greater than the pH change of the treated tissue would indicate. The tomato plants showed both epinasty and hyponasty response to HCN which was followed by injury to the petioles. The HCN injury to the petiole tissue progressed after removal from the gas until the whole plant was destroyed. Plants were injured by Cl2 and SO2 to a greater extent during clear than during cloudy weather. (Authors' summary)##

04984

118

P. W. Zimmerman

IMPURITIES IN THE AIR AND THEIR INFLUENCE ON PLANT LIFE.
Proc. Natl. Air Pollution Symp., 1st, Pasadena, Calif., 1949
pp. 135-41

The fact that several impurities in the air influence plant life has been fairly well established. The toxic impurities most frequently encountered are sulphur dioxide, hydrogen fluoride, chlorine, hydrogen sulphide, ammonia, esters of growth-regulating substances, and constituents of manufactured illuminating gas. To aid in identifying characteristic effects, several species of plants have been subjected to these gases under controlled experimental conditions.##

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EFFECTS - MATERIALS

08612 119

Bacskai, Gyula

AIR POLLUTION BY THE CHEMICAL INDUSTRY AND ITS EFFECT ON THE CORROSION OF CONSTRUCTION MATERIAL. ((Vegyipari atmoszfera szennyezodese es hatasa a szerkezeti anyagok korroziojara.)) Text in Hungarian. Magy. Kem. Lapja (Budapest), 22(10):534-539, 1967. 7 refs.

Concentrations of air pollutants,such as chlorine,phenol, ammonia, SO2, and NO2, in different Hungarian chemical plants are given and the effect of these pollutants on corrosion of construction materials, particularly iron and zinc is discussed. Corrosion is increased by the gaseous and solid contaminants of the atmosphere. Deeper insight into atmospheric corrosion mechanisms is required to provide efficient protection.

00695 120

R. V. Chiarenzelli and E. L. Joba

THE EFFECTS OF AIR POLLUTION ON ELECTRICAL CONTACT MATERIALS: A FIELD STUDY. J. Air Pollution Control Assoc. 16, (3) 123-7, Mar. 1966. (Presented at the 58th Annual Meeting, Air Pollution Control Association, Toronto, Canada, June 20-24, 1965.)

A long-term field and laboratory program designed to determine and understand the effects of air pollutants on electric contact materials and their performance has reached the one-year mark. An extensive variety of precious and nonnoble metals and alloys has been exposed for periods ranging up to one year (August 1963 to August 1964) at 6 field environments. These environments were selected to provide a wide range of air pollutants in typical data processing or process control situations and comprise such diverse locations as an air-conditioned data processing room in New York City, an east coast oil refinery, an east coast chemical plant, a business location in Los Angeles, a paper mill in the south, and a heavy manufacturing plant in Buffalo. The program undertakes to correlate material degraduation as a function of time and environment. Humidity, temperature, and sulfur dioxide are measured on a continual basis, and point-in-time measurements of dust, HF, aldehydes, oxidants (ozone), NO2, SO2, H2S, NH3, and Cl are made on a quarterly basis.

Materials are returned periodically and evaluated in the laboratory by contact resistance probing, electrolytic reduction, and standard metallographic techniques. The results of the program to date are presented, and preliminary correlations are drawn. The program is evaluated from the vantage point of the one year mark. Deficiencies and aspects of special utility are described. (Author abstract)##

121

06601

M. C. Muffley

INFLUENCE OF ATMOSPHERIC CONTAMINANTS ON CORROSION - LITERATURE REPORT. Rock Island Arsenal, Ill. (Rept. No. 63-2041.) 23 pp. (June 13, 1963). DDC: AD 420 118
DDC: AD 420 117

The influence of atmospheric contaminant gases and particulate matter upon the corrosion rates of ferrous and nonferrous metals is investigated. Various means of protection from, of atmospheric such corrosive environments are reviewed. Variations in the rate of corrosion coincide with the severity of atmospheric pollution in different locations where average humidity is approximately the same. Data from the tests in both industrial and marine atmospheres, reveal that very great differences in corrosivity can exist at locations only a few miles apart, or, in some extreme cases, only a few 100 feet apart. The corrosion rates of various metals or alloys for various environmental conditions are given. Corrosion of metals can be overcome: (1) by eliminating the contaminants that cause corrosion of metal parts, (2) by preventing the contaminants from coming in contact with the metal surface, and (3) by using a metal finish that will be resistant to the specific atmosphere.##

122

19491

Niskanen, Eric and U. Martius Franklin

ATMOSPHERIC CORROSION OF COPPER AND SOME COPPER ALLOYS. Can. Met. Quart., 9(1):339-344, March 1970. 6 refs.

Two-year atmospheric corrosion tests in an urban environment were conducted on specimens of copper, Muntz metal, and copper-zinc-aluminum alloys. The films on the top surface and underside of the exposure coupons were studied by X-ray diffraction and X-ray spectrography. Differences between the two surfaces are attributed to the leaching action of rain and the possible effect of direct sunlight. The corrosion products of copper consisted mainly of Cu2O, and also included a substance of undetermined composition, copper chloride, and basic copper chloride. The zinc-containing alloys formed similar products, along with zinc sulfates, and showed considerable dezincification. A pre-oxidation treatment of the copper-zinc-aluminum alloy gave a small increase in corrosion resistance, particularly on the underside of the coupon. The addition of aluminum to a copper-zinc alloy does not change the corrosion products, but does reduce the corrosion rate and the amount of dezincification which occurs. (Author abstract modified)

12055

Nowak, F.

CORROSION PROBLEMS IN INCINERATORS. Combustion, 40(5):32-40, Nov. 1968.

The state of the art of corrosion in incinerators is reviewed. While at first glance there seems to be no great difference between an incinerator whose generated heat is being used for steam generation and a boiler fired with conventional fuel, in fact many more problems are encountered due to the heavy deposits, more frequent outages, and gas-side corrosion of heating surfaces. Due to the nonhomogeneous nature of the waste materials and the corrosive components in the flue gas which are steadily increasing with the increase in plastics and other industrial wastes fired, control of conditions in incinerators is difficult. Some examples of corrosive experience and some approaches to control of the problems are discussed.##

AIR QUALITY MEASUREMENTS

02066 **124**

W. Breuer, and K. Winkler.

SOURCES AND DISTRIBUTION OF AIR POLLUTIONS ASCERTAINED BY STATIONARY RECORDING OF GASEOUS COMPONENTS. Herkunft Und Ausbreitung Von Luftverunreinigungen, Ermittelt Durch Stationare Registrierung Mehrerer Immissionskomponenten. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper VII/10). pp. 239-42.

Simultaneous, continuous and stationary measurement of the concentration of gas components (CO, CO_2, SO_2, H_2S, Cl_2, nitrous gases, hydrocarbons) combined with the recording of meteorological factors (wind direction, speed of wind, atmospheric stability etc.) enable the identifying of the source of air pollutions (motor vehicle exhaust, domestic heating, power stations, chemical works). The examination of special air conditions and statistical evaluation gives information on the process of distribution. (Author abstract)##

NOT REPRODUCIBLE

00082 **125**

H.W. Georgii E. Weber

THE CHEMICAL COMPOSITION OF INDIVIDUAL RAINFALLS. Institut fur Meteorologie und. Geophysik, Frankfurt/M, Germany. AFCRL-TN-60-827, July 1960. 38 pp.
CFSTI, DDC: AD 266285

The chemical composition of individual cases of rainfall was analyzed at 3 different sampling stations. The locations where these samples were taken showed a great variety with respect to altitude, climate and level of industrial and anthropogeneous pollution. A relation between the concentration of trace substances in rainwater and the quantity of rain was found which obeys a power law. The amount of trace substances in rainwater shows a marked increase after a preceding period of dry days. Changes in the concentration of atmospheric aerosols and trace gases caused by the effect of precipitation are described. (Author)##

17102

Porik, Jozsef 128

MEASUREMENT OF AIR POLLUTION IN HUNGARIAN INDUSTRIAL CENTERS. (A levego szennyezettsegenek merteke ipari telepuleseinken). Text in Hungarian. Magy. Tud. Akad. Orvosi Tud. Oszt. Kozlemen., 18(3/4):417-424, 1967.

Budapest has by far the most serious air pollution problems of any Hungarian industrial center, as shown by large scale measurements over a 10-15 year period. Data is presented in the form of 7 tables, compiled both by the author and by other Hungarian authors, based on studies of air pollution in Hungarian metropolitan areas. Eleven such areas, including Budapest, almost consistently show values in excess of the legally permissible limits of dust, carbon particles, and sulfur dioxide. In some of these communities, there are also excesses of such dangerous substances as chromium, phenol, beryllium, copper, silicon, and manganese. In the industrial sectors of the big cities, in addition to soot, dust, and sulfur compounds resulting chiefly from some type of combustion, one also finds a noticeable content of ammonia, the nitrogen oxides, chlorine gas, and organic chlorine compounds such as chlorphenol. The stench of some of these organic compounds, particularly the chlorinated hydrocarbons, is noticeable as much as 15-20 kilometers away. Measurements of fluorine pollution in the vicinity of the Varpalata aluminum plant gave figures of 0.097 mg of fluorine per cu meter at 2 km distance from the plant, and 0.67 mg at a distance of 20 meters. The permissible limit is 0.01.

01317

T. Okita 129

SOME CHEMICAL AND METEOROLOGICAL MEASUREMENTS OF AIR POLLUTION ASAHIKAWA. Intern. J. Air Water Pollution, Vol. 9:323-332, June 1965.

Fog water and particulates sampled in the urban and rural areas of Asahikawa were subjected to chemical analyses. It was found that calcium sulfate was enriched in fog water, and that nitrite was also enriched in urban fogs. Ammonium sulfate and sulfuric acid were not major constituents in urban fog. Photometer measurements of the areal distribution of suspended particulates were also made. In light winds, with below freezing temperatures, a local circulation converging toward the urban areas was noted, and pollutants were found to accumulate over the center of the urban area. (Author abstract)##

21419

Perin, G., V. Gasparini, and C. Piccoli 130

AIR POLLUTION IN THE CITY OF BOLZANO. PART II: RESULTS AND REFLECTONS ON FOUR YEARS OF STUDIES. (L'inquinamento atmosferico

04996 126

M. Katz

SOURCES OF POLLUTION. Proc. Natl. Air Pollution Symp., 2nd, Pasadena, Calif., 1952. pp. 95-105

The wind and cloud conditions in the Detroit River area for five years are summarized. Sulfur dioxide was measured by antometers. Hydrogen sulfide, chlorine, oxides of nitrogen, and ammonia were sampled. Suspended particulates were collected. The distribution of dust fall components is tabulated. About twenty metallic elements were identified by x-ray diffraction of suspended particulates. Community health surveys covering morbidity and mortality records and accounting for ethnic and socioeconomic factors are outlined.##

21079 127

Loucks, Ronald R., John J. Winchester, Wayne B. Watson, and Mary A. Tiffany

THE HALOGEN COMPOSITION OF AEROSOL PARTICLES OVER LAKE MICHIGAN. In: Modern Trends in Activation Analysis. James R. DeVoe (ed.), vol. 1, Washington, D. C., National Bureau of Standards SP312, Dept. of Commerce, 1969, p. 36-42. 10 refs.

Results of the first intensive sampling of aerosols for halogens in the inland U. S. are presented in tables. Previously published analyses of aerosols for the halogen elements bromine, chlorine, and iodine were restricted to coastal locations where local sources of sea salts are present. The inland sampling was carried out with a cascade impactor and an Andersen sampler in the southern basin of Lake Michigan and in runs between Grand Haven and Chicago. Chemical analysis for halogens was done by neutron activation and anodic stripping. A large fraction of both iodine and bromine was found to be held by particles less than 0.25 micron radius, without apparent systematic differences due to location, winds, or relative humidity. However, total iodine concentrations did not vary with proximity to the Chicago-Gary area, implying that iodine has no significant pollution sources associated with urbanization. In contrast, the differences in bromine values strongly suggest an urban pollution origin for such atmospheric bromine. Negligible amounts of chlorine were held by particles smaller than 0.25 micron radius, but a third of it was held by particles above 1 micron radius, without apparent correlation with meteorological parameters. A local industrial pollution source other than automobile or fuel combustion is suggested.

17102 128

Morik, Jozsef

MEASUREMENT OF AIR POLLUTION IN HUNGARIAN INDUSTRIAL CENTERS. (A levego szennyezettsegenek merteke ipari telepuleseinken). Text in Hungarian. Magy. Tud. Akad. Orvosi Tud. Oszt. Kozlemen., 18(3/4):417-424, 1967.

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01317 129

T. Okita

SOME CHEMICAL AND METEOROLOGICAL MEASUREMENTS OF AIR POLLUTION ASAHIKAWA. Intern. J. Air Water Pollution, Vol. 9:323-332, June 1965.

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21419 130

Perin, G., V. Gasparini, and C. Piccoli

AIR POLLUTION IN THE CITY OF BOLZANO. PART II: RESULTS AND REFLECTONS ON FOUR YEARS OF STUDIES. (I'inguinamento atmosferico della citta di Bolzano. Nota II: Risultati e considerazioni di un quadriennio di Ricerche). Text in Italian. Ann. Sanita Pubblica (Rome), 30(5):795-831, 1969. 110 refs.

Air pollution studies in the city of Bolzano were begun in 1963 and interrupted at the end of 1964, at which time a city ordinance required the installation of smoke purifiers in home heating plants. Studies were resumed in September 1965 and terminated in the spring of 1967. At 6 sampling stations, the pH of rainwater was determined, as well as the presence of dust, calcium, magnesium, chloride, fluoride, sulfate ions, sulfur dioxide, chlorine gas, iron, fluorine gas, and aluminum; dust was additionally analyzed according to size of particulates. Meteorological conditions were also observed. Comparing the two periods of study, insoluble tarry substances notably decreased after the installation of smoke purifiers, while the content of insoluble inorganic pollutants increased, particularly at two stations. Chloride ion content was higher in the summer. Taking account of seasonal variations, the sulfur dioxide content was clearly reduced during the second period of study. In comparison with other cities, the residential areas of Bolzano showed better air quality than such areas in Melbourne, Naples, Modena, and London, while the industrial zone was about comparable to that of such large industrial complexes as Nagoya, Muenster, Mestre-Marghera, and Pittsburgh. Neither the industrial nor the residential zones gave values that exceeded the acceptable limits.

08780 131

Prave, V. E., F. I. Radutskii, R. I. Radomysl'skaya,
and A. L. Volhova

THE CHLORINE CONTENT IN THE AIR OF DWELLINGS DISINFECTED WITH CHLORAMINE SOLUTIONS. ((Soderzhanie khlora v vozdukhe zhilykh pomeshchenii posle dezinfektsii rastvorami khloramina.)) Hyg. Sanit. (English translation of: Gigiena i Sanit), 32(7-9): 280-283, July-Sept. 1967. 3 refs.
CFSTI: TT 67-51409/3

The air in places where disinfection had been carried out was tested. These were dwellings in the Timiryazev district of Moscow which had been disinfected after open cases of tuberculosis had been transferred to the hospital, or after cases of infectious hepatitis, dermatomycosis and other communicable diseases. Six samples were taken in each case: two during disinfection of the room and two while the corridor surfaces were being sprayed. Tests of 60 air samples showed that the chlorine concentration in closed premises varied from fractions of a milligram to tens of milligram to tens of milligrams per cu m during the final disinfection with aqueous chloramine solutions. Chlorine concentrations below the maximum permissible level for working premises were found in 1/10 of all samples; in 34 cases they were found to be several times higher than the maximum level (up to 10 mg/cu m) and in 1/3 of the cases they were ten or more times the maximum permissible concentration (up to 56 mg/cu m). Thus, the chlorine content exceeded the maximum permissible level for working premises in 9/10 of all samples. The effects of various factors (or of their combinations) on the chlorine content of the air of premises disinfected with chloramine solutions were not studied. Neverthless, certain important factors must be mentioned. The chlorine content in the air of the premises was not entirely dependent on the concentration and amount of chloramine solution used, but also depended on other factors, such as the rate of release of chlorine from the activated solution into the air. The disinfection techniques used also played a certain part, such as dipping objects in the disinfection solution, wiping objects with a rag wetted with the solution, or spraying. (Authors' summary, modified)##

06269 132

F. Steinhauser

ON THE AMOUNT OF CHEMICAL IMPURITIES IN THE AIR AND PRECIPITATION. Uber den Gehalt an chemischen Beimengungen von Luft und Niederschlagen. Idojaras (Budapest) 68, 348-63, Dec. 1964. Ger.

Samples of the air and of precipitation, collected within a period of 6 years (1958-63) in various parts of Austria, were analyzed by microchemical methods of the type used at Uppsala University. Analysis was made for the content of: S, Cl, NH4-N, Na, K, Mg, and Ca. Especially for the precipitation studies an analysis was made for NO3-N, and the pH of each sample was also recorded. Annual variations, and the effects of local features on the admixtures, are discussed. Additional measurements were made of the SO2 content of the air in the cities of Vienna and Graz and in the southern portion of the area around Vienna. These annual values (in mg. SO2/100 sq cm of air/month) were found to be: In Vienna, in the center of the city, 114.4; in Vienna, on the northwestern border of the city, 41.3; in Graz, in the center of the city, 247.2; and in Graz, on the eastern border of the city, 56.2. The CO2 content of the air (in ml. CO2/10 liters air, given seasonally on a quarter of a year basis) was found to be highest in Vienna, next highest in Klagenfurt, and lowest in Retz. In winter these figures were 3.53, 3.30, and 3.20; in spring, 3.36, 3.14, and 3.05; in summer, 3.28, 3.06, and 2.98; and in fall 3.34, 3.20, and 3.07.

NOT REPRODUCIBLE

21078 133

Styazhkin, V. M.

EXPERIMENTAL BASIS FOR THE DETERMINATION OF ALLOWABLE CONCENTRATIONS OF CHLORINE AND HCl GAS SIMULTANEOUSLY PRESENT IN ATMOSPHERIC AIR. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:158-164, 1963. (B. S. Levine, ed.)
CFSTI: 63-11570

An experimental basis for the determination of allowable concentrations for simultaneously present chlorine and HCl gas in the ambient air was obtained. Studies were conducted in the vicinity of a magnesium plant at 300, 500, 800, 1000, 2000, and

3000 m from the plant. Air samples were collected by the aspiration method through an absorber equipped with a porous plate No. 1. One absorber was filled with double distilled water; the other was filled with an acidified solution of methyl orange. Air samples collected through double distilled water were used for the determination of HCl aerosol by the titration method. Sulfuric acid, which interferred with analysis, was determined nephelometrically and subtracted from the titration result. Chlorine was determined colorimetrically in the sample. Results showed that chlorine and HCl gas concentrations were considerably in excess of the allowable maximal single concentration limit at all collecting points. The threshold of Cl odor preception was 0.7 mg/cu m and of HCl gas, 0.2 mg/cu m. Threshold odor perceptions of Cl and HCl gas simultaneously present in the air were established in the following combinations: 0.3 mg/cu m Cl, 0.1 mg/cu m and 0.2 mg/cu m Cl, 0.13 mg/cu m HCl. Results of the tests by the optical chronaxy method established the threshold of reflex effect of Cl and HCl gas simultaneously present in the air in the following concentration: 0.3 mg/cu m Cl, 0.2 mg/cu m HCl and 0.2 mg/cu m Cl, 0.3 mg/cu m HCl. The limit of maximal single concentration for Cl was 0.1 mg/cu m and for HCl, 0.05 mg/cu m. The simultaneous presence of Cl and HCl gas in the air in corresponding concentrations had no effect on the control curve of dark adaptation. Results showed that the concentrations were below the threshold of odor perception and reflex effect and below the allowable concentration limit.

STANDARDS AND CRITERIA

00411 134

K. Horn

(THE PROBLEM OF HYGIENICALLY PERMISSIBLE LIMITING CONCENTRATIONS OF AIR POLLUTION.) Zur Frage der Hygienisch zulassigen Grenzkonzentrationen fur Luftverunreinigungen. Angew. Meteorol. (Berlin) 5 (Special Issue) :39-43, 1965. Text in Ger.

The problem of determining permissible limits of air pollution is discussed. After listing four categories of pollution ranging from decreased visibility and injury to sight and smell to acute illness and possibly death, the aurthor states that pollution should be kept below the limits of the first category. He distinguishes between limits permissible in a factory area and in a residential area, the first being higher. Permissible limits for 40 chemicals established in 1963 for single occurrences and average 24 hour concentrations for East Germany are tabulated.##

01270 135

M. Katz

QUALITY STANDARDS FOR AIR AND WATER. Occupational Health Rev. (Ottawa) 17(1):3-8, 1965. (Presented at the Occupational Health and Safety Conference, Canadian Congress of Labour, North Bay, Ontario, Nov. 16, 1964).

Author reiterates air quality standards and threshold limit values for gases and vapors (ppm) in the USSR and USA: ambient air quality standards and workroom air threshold limit values for some gases (carbon monoxide, chlorine, hydrogen chloride, ethylene, ozone, oxides of nitrogen and sulfur dioxide); air quality standards and threshold limit values for solids or liquids; and comparative ambient air quality standards for particulate matter. Data are given for California, Oregon, USSR, Czechoslovakia and West Germany.##

92019

E.A.J. Mahler 136

STANDARDS OF EMISSION UNDER THE ALKALI ACT. Proc. (Part I) Intern. Clean Air Cong., London, 1966. Paper III/12). pp. 73-6.

The evolution of standards of emission under the Alkali Act over the past 100 years is briefly reviewed. The necessity for considering heights of discharge of pollutants as well as their concentration in the emissions and mass rates of discharge to atmosphere is stressed. It is also indicated that standards should be simply and clearly expressed in such a manner that their due observance can readily be checked by short and simple tests. An outline is given of the principles adopted in arriving at the current standards and these, both in regard to concentrations in emissions and heights of discharge, are listed. The author expresses the personal view that present tendencies in ever increasing size of production units and complexity of operations on one site must inevitably lead to necessity in the future further to reduce emissions. Because of the cost of such a step he suggests that setting up and adoption of international standards is a desirable end. (Author abstract)##

NOT REPRODUCIBLE

05980

V. A. Ryazanov 137

NEW DATA ON LIMITS OF ALLOWABLE ATMOSPHERIC AIR POLLUTANTS. (In: Limits of allowable concentrations of atmospheric pollutants. Book 6.) U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, Vol. 9. pp. 1-8. (1962). Russ. (Tr.)

This volume contains material discussed by the Committee on Sanitary Air Protection during its 1959 and 1960 sessions. The material contained in this volume is of heterogenous character in its methodological presentations and completeness and finality of the reports. The Committee took the position that the level of methodology reached during the last period of investigation and the degree of reliability of results obtained did not represent the acme of perfection, and therefore, the proposed limits of allowable concentrations should be regarded as mere points of orientation for future studies, leading to more basic, more scientific and hence, more reliable limits of atmospheric air pollutants. In this connection it is the aim and purpose of this Committee to act as the stimulator, guide and directing agent leading into investigational channels based on the outlined principles. Air pollutants studied include formaldehyde, HCl aerosol, CS_2 vapor, Mn, Hg, combined Cl_2 and HCl gas, acetone, CO and Dinyl (mixture of diphenyl and diphenyl oxide).#
#

07492

138

Suzuki, T.

ON THE PERMISSIBLE CONCENTRATION OF AIR POLLUTANTS IN SOME COUNTRIES. Text in Japanese. J. Jap. Petrol. Inst. Tokyo, 7(2):87-91 Feb. 1964. 4 refs.

There are no "international" permissible values of air pollutant concentrations at present. The maximum allowable concentrations and their methods of determination differ between countries. Values obtained in the Soviet Union, Czechoslovakia, West Germany, and the United States are compared. The values of permissible concentration are very low in the Soviet Union, even seemingly impossible of realization. Permissible values for 32 substances are tabulated. In West Germany, the values are expressed by MIK (Maximale Imission Konzentration) recommended by the VDI (Verein Deutscher Ingenieure). According to definition, the "Imission" value is the concentration of the elements found undesirable for "normal air". With MIK, only SO2, nitrogen oxides, H2S, and chlorine are regulated. Consideration of exposure time is also given. Values obtained in Czechoslovakia are for 16 materials determined as was done in the Soviet Union. As for the United States, present methods of establishing MAC (Maximum Allowable Concentration) are described. Values for SO2 determined in California are tabulated.##

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BASIC SCIENCE AND TECHNOLOGY

16397

Andrew, S. P. S. 139

A SIMPLE METHOD OF MEASURING GASEOUS DIFFUSION COEFFICIENTS. Chem. Eng. Sci., 4(6):269-272, 1955. 4 refs.

A knowledge of the gaseous diffusion coefficient for a specified gas mixture is frequently necessary in designing absorption and stripping towers. A new measurement method enables coefficients to be readily obtained with sufficient accuracy for design purposes. It consists essentially of measuring the amount of equimolar counter-diffusion occurring in a diffusion tube connecting two flasks containing initial gas mixtures of different concentrations. Values of diffusion coefficients obtained by this method were compared with previous measurements for two of the gases, and satisfactory agreement was found. Coefficients were given for the diffusion of CO_2, NH_3, SO_2, Cl_2, and Br_2 at 20 C and 760 mm Hg. (Author abstract modified)

17917

Asinger, Friedrich 140

PRODUCTION OF ORGANIC SULFUR COMPOUNDS. (Gewinnung organischer Schwefelverbindungen). Text in German. (Farbenindustrie (I. G.) A.-G., Frankfurt, Germany) W. German Pat. 711,821. 3p., Jan. 29, 1939. (Appl. date not given, 2 claims).

A method for producing organic sulfur compounds was devised which is characterized by adding hydrogen-rich hydrocarbons to the mixture of compounds containing oxygen, sulfur, and a halogen. These mixtures are obtained in the familiar way by reacting SO_2 and the halogen with saturated, preferably paraffinic hydrocarbons with high boiling points. The layers which form upon addition of the hydrogen-rich hydrocarbons can be easily separated. Selection of the type of hydrogen-rich hydrocarbons depends on the components of the product used. Three practical examples are given. For 500 parts of chlorine, oxygen, and sulfur containing product, 800 parts of hydrogen-rich hydrocarbons are needed. Usually the same mixture of hydrocarbons is used from which the chlorine, oxygen, and sulfur containing product has been obtained. This method of separation yields substances with different capillary action.

141

16605

Asinger, Friedrich

THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON ALIPHATIC HYDROCARBONS IN ULTRAVIOLET LIGHT. IV PART: THE PRODUCTS OF THE COMMON INFLUENCE OF SULFUR DIOXIDE AND CHLORINE ON N-DODECANE. (Zur Kenntnis der Produckte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf aliphatische Kohlenwasserstoffe im ultravioletten Licht, IV. Mitt.: Die Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf n-Dodecan). Text in German. Chem. Ber., 77-79(3-4):191-194, 1944. 13 refs.

In a study of the reactions of high molecular straight-chained paraffines hydrocarbons to sulfochlorination, n-dodecane was subjected to a partial sulfochlorination to avoid excessive di and polysulfochloride formation. The sulfochlorides were liberated from the unconverted hydrocarbon through selective extraction with liquid SO_2. Di and polysulfochlorides were precipitated from mixtures with monosulfochlorides with pentane. The mixture of monosulfochlorides was then desulfurized, leaving a mixture of dodecyl chlorides in which the chlorine assumed the same position as previously held by the sulfochloride group. The dodecyl chloride mixture was converted into dodecylenes with silver stereate. From 100 g of dodecylene mixture 87g water-insoluble fatty acids were obtained. The composition of the individual acids in mol percent was: C6 17.2, C7 18.6, C8 16.6, C9 19.2, C10 18.1 and C11 10.3.

142

17563

Asinger, Friedrich, Walter Schmidt, and Franz Ebeneder

PRODUCTS OF THE JOINT ACTION OF SULFUR DIOXIDE AND CHLORINE ON ALIPHATIC HYDROCARBONS IN ULTRAVIOLET LIGHT. 1ST COMMUNICATION: PRODUCTS OF THE JOINT ACTION OF SULFUR DIOXIDE AND CHLORINE ON PROPANE DISSOLVED IN CARBON TETRACHLORIDE. (Zur Kenntnis der Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf alipathische Kohlenwasserstoffe im ultravioletten Licht, I. Mitteil.: Die Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf Propan in Tetrachlorkohlenstoffloesung). Text in German. Chem. Ber., vol. 75B:34-41, 1942. 18 refs.

The reaction products were determined of the joint action of chlorine and sulfur dioxide on propane in a carbon tetrachloride-solution at room temperature exposed to ultraviolet radiation. Two and one-half (volume) parts of propane, 1.1 parts of Cl and 1 part of SO_2 were dissolved in CCl_4 in a quartz tube irradiated by a mercury-vapor lamp. After completion of the reaction, CCl_4 was distilled off and the reaction product remained in the residue, from which a liquid mixture of propane monosulfochlorides, chloropropanemonosulfochlorides, dichloropropanemonosulfochlorides, and a few higher chlorination products of propane were distilled off under reduced pressure. The remaining non-distillable residue was a propane disulfochloride which melted at 48 C after being purified by crystalization from chloroform-carbon-tetrachloride mixtures. The distilled off propane monosulfochlorides ($C_3H_7O_2ClS$), after additional purification were found to be 1:1 mixtures of the isomers: propane-1-sulfochloride and propane-2-sulfochloride with a boiling point at 72 to 79C. From these a 1:1 mixture of the isomers: propane-1-sulfamide and propane-2-sulfamide ($C_3H_9O_2NS$) with a melting point at 238 C was obtained by a specified procedure. The propane disulfochloride ($C_3H_6O_4Cl_2S_2$) is definitely the propane-1,3-disulfochloride from which propanedisulfamide ($C_3H_{10}O_4N_2S_2$) melting at 173 C and propanedisulfanilide ($C_{15}H_{18}O_4N_2S_2$) melting at 130 C were obtained by specified procedures. For verification of the above findings all of the above compounds were synthesized by purely chemical methods. In the course of this work, propane-1-sulfanilide, and propane-2-sulfanilide were produced which are still liquid at -10 C.

15063 143

Beams, J. W. and C. Skarstrom

THE CONCENTRATION OF ISOTOPES BY THE EVAPORATIVE CENTRIFUGE METHOD. Phys. Rev., vol. 56:266-272, Aug. 1, 1939. 19 refs.

The air-driven vacuum-type tubular centrifuge was used for the separation of the isotopes of chlorine by the evaporative centrifuge method. The separations obtained were about the same as predicted by the theory provided that experimental conditions approximately conformed to the assumptions of the theory. With a steel tube 11 in. long and 3 in. inside diameter, containing baffles to prevent remixing, and spinning at 1060 rps, carbon tetrachloride vapor was withdrawn from the axis at the rate of 3.2 grams per minute without decreasing the separation factor. This separation factor for chlorine, which at any instant is the ratio at the periphery, was 1.025 in the above case. It is believed that the method is practical in the case of the heavier elements, but inferior to other centrifuge methods where large concentrations of the isotopes in smaller quantities of material are used. (Author abstract modified)

16036 144

Becker, H. G.

MECHANISM OF ABSORPTION OF MODERATELY SOLUBLE GASES IN WATER. Ind. Eng. Chem., 16(12):1220-1224, Dec. 1924. 6 refs.

The absorption of oxygen and nitrogen in air-free water was studied under conditions allowing the absorption process to be followed step by step from zero concentration of dissolved gas to saturation in both mixed and unmixed liquids. Experiments are also reported on the absorption of other gases of widely different solubilities in unmixed water. When liquid is kept mixed, the solubility of oxygen and nitrogen diminishes with increasing temperature and the percentage saturaton of the liquid increases with time. Observations on the absorption of oxygen in liquid stirred at varying speeds indicate that absorption is proportional to time, i.e., the rate of solution is constant in water of zero oxygen content. When oxygen accumulates in the water, the rate of solution is proportional to the degree of unsaturation. In unmixed liquid, the rate of solution follows a regular course while the oxygen content of water is low, but becomes quite irregular when the water is 60 to 70% saturated. Gases such as carbon dioxide, hydrogen, and hydrogen sulfide form saturated layers at the surface of liquid, which cause the rate of solution to fall off rapidly. Gases such as nitrous oxide, nitric oxide, and chlorine show no tendency to form saturated surface layers and are absorbed at correspondingly higher rates.

03062 145

S. W. Benson and G. R. Haugen.

ESTIMATED ACTIVATION ENERGIES FOR THE FOUR-CENTER ADDITION REACTION OF H2, HX, AND X2 TO ACETYLENES. J. Phys. Chem. 70, (10) 3336-9, Oct. 1966

The application of an electrostatic model to predict the activation energy of the four-center addition reactions of acetylene is discussed. The transition state is considered as intimate semi-ion pair with an equivalent charge separation of plus or minus formal charge. The energy of activation can be equated to the electrostatic energy of interaction of point dipoles. Values obtained for the reacting substances (acetylene, methyl acetylenes, hydrogen halides, hydrogen, fluorine, chlorine, bromine, iodine) are tabulated. The activation energy for the molecular addition to acetylenes is about 1.5 kcal/mole smaller than that for the corresponding olefin.##

15990 146

Fox, Arthur L., Clyde O. Henke, and Cortes F. Reed

PURIFICATION OF HYDROCARBON-SULPHUR DIOXIDE-CHLORINE REACTION PRODUCTS. (Charles L. Horn, Minneapolis, Minn. and DuPont De Nemours (E.I.) and Co., Wilmington, Del.) U. S. Pat. 2,228,598. 6p., Jan. 14, 1941. (Appl. June 30, 1938, 15 claims).

A process is described for purifying surface-active compounds formed by reacting hydrocarbons, sulfur dioxide, and chlorine and hydrolyzing the resulting product. The invention provides a method of removing water-insoluble oils from the emulsion obtained when hydrocarbons are treated with a gaseous mixture of sulfur dioxide and chlorine and the resulting product is hydrolyzed with a hot caustic alkali. The method is exemplified by the treatment of a hydrocarbon oil with a gaseous mixture of sulfur dioxide and chlorine in the presence of light until the oil gains a certain weight. This produce is hydrolyzed and neutralized with a caustic alkali solution. The crude product that is obtained is an aqueous emulsion of hydrocarbon sulfonates, unreacted hydrocarbon, chlorinated hydrocarbon, and salts. This material is purified by diluting with water or a water-soluble organic solvent and removing the water immiscible layer. Purification can also be accomplished by centrifuging without dilution, by extracting the water insoluble portions with a water insoluble organic solvent, by steam distillation, or by a combination of these processes. Many of the products prepared according to the invention have excellent foaming and cleansing properties. These products can serve as intermediates for preparing derivatives useful as plasticizers for paint, varnishes, corrosion inhibitors, gum solvents, extractants for the refining of gasolines and oils, insecticides, detergents, wetting agents, and rewetting agents. They may also be used to improve flotation processes of ores, pigments, coals, etc. and to break petroleum emulsions. Other uses include fungicides, mildew preventives, penetrating agents, and dust collecting agents.

17134

147

Gilliland, E. R., R. F. Baddour, and P. L. T. Brian

GAS ABSORPTION ACCOMPANIED BY A LIQUID-PHASE CHEMICAL REACTION. Am. Inst. Chem. Engrs. J., 4(2):223-230, June 1958. 14 refs.

The rate of absorption of chlorine from chlorine-nitrogen mixtures into solutions of ferrous chloride in 0.203 N aqueous hydrochloric acid was studied in a short wetted-wall column. Dimensional analysis and the film and penetration theories were used to infer, from the absorption rate data, that the chemical reaction between chlorine and the ferrous ion is second order. The absorption-rate results for experiments with a dilute gas phase agreed with theoretical predictions for absorption accompanied by a second order reaction with a reaction rate constant of 188 liters/(g mole)(sec). The results for experiments with pure chlorine gas deviated from the rest of the results, and they did not agree with the theoretical equations. It was shown that the assumption of a three-step mechanism for the chemical reaction, including the formation of a complex ion and the decomposition of this complex ion, explains, at least qualitatively, the deviations observed for the pure chlorine gas runs. (Author abstract modified)

04228L

148

P. Goldfinger, G. Huybrechts, and L. Meyers

THE CHLORINE PHOTOSENSITIZED OXIDATION OF HYDROCARBONS AT LOW TEMPERATURE (FINAL TECHNICAL REPT.). University Libre de Bruxelles, Belgium, Laboratoire de Chimie Physique. Jan. 1966. 30 pp.

The study of the chlorine photosensitized oxidation of trichloroethylene has been completed. A mechanism has been proposed for this reaction where dichloroacetyl chloride is the main reacton product and the rate constants of the relevant elementary reaction steps were estimated. This together with preceding studies on the oxygen effect on the photochlorination of ethane and trichloroethylene has led to a reaction theory which seems to be of general validity. In the second part of this report a new reaction theory of chlorine photosensitized oxidation of hydrocarbons is presented which describes many of the kinetic investigations that have been carried out by the present work and reported in the literature. Due to the diversity of radicals in the reaction mechanism and the formation of different products not sufficiently unreactive, the reaction mechanism is not in final form and more experimental work is needed. (Author abstract)##

03349 149

I. C. Hisatsune.

STRUCTURES OF SOME OXIDES OF NITROGEN (SUMMARY PROGRESS REPT. OCT. 27, 1965 - DEC. 31, 1966). Preprint. Dec. 31, 1966.

The kinetic study of the third order reaction between NO and O2 was completed. Partial pressures of NO and O2 were varied from one to 200 mm and one to 470 mm respectively, and mole ratios of these reactants were chosen so that the final partial pressures of the reaction product NO2 were between one and 14 mm. Nitrogen gas was used as diluent in order to maintain essentially a constant total pressure (near 480 mm) during the reaction. The reaction was followed by recording the changes in the absorption intensity of the 1640 cm-1 NO2 IR fundamental band. Kinetic runs were made with one reactant in excess, and the resulting experimental data gave pseudo first or second order rate plots which were linear over 80 to 90 percent of the reaction. The temperature dependence of the rate constants was studied between 4 and 55 C. In this case, both the reaction cell and the reactant storage bulbs were maintained at constant temperature. From the tabulated experimental data a rate constant for this third order reaction was obtained: k = (6.18 + or - 0.20) x103 exp(+0.50 + or - 0.40 kcal/mole)/RT) liter 2 / mole 2 -sec where the estimated uncertainties are maximum errors. Kinetic studies on the NO-C12 and NO-Br2 systems were initiated. In the case of the chloride system, the reaction was found to be influenced by fluorescent light but not by the IR light source. Tentative values of the rate constant at 22.7 C were found to be 19.6 + or - 0.7 and (7.92 + or - 0.42) x 1000 liter 2/mole 2 - sec respectively for the chloride and the bromide.##

14313 150

Lederer, E. L.

VERIFYING ADSORPTION FORMULAS BY MEANS OF ADSORPTION MEASUREMENTS WITH ACTIVATED CHARCOAL. (Pruefung von Adsorptionsformeln an Hand von Adsorptionsmessungen bei einer hochaktiven Kohle).

Text in German. Kolloid-Z. (Stuttgart), 61(3):323-328, 1932. 15 refs.

Data reported by Remy on the adsorption of gases and vapors on activated charcoal were used to verify isothermal and isobaric adsorption laws. In the isothermal case, no decision can be made between a logarithmic law and the formula of Langmuir. In the isobaric case, a logarithmic law seems to fit the results best. The isosteric curve of Trouton and Poole and the relationship of Gurwitsch fit the data only moderately well. The relationship between the vapor pressure and the adsorbed volume of various gases indicates that equal amounts of different gases are adsorbed, referred to corresponding states. Gas mixtures are adsorbed proportionally, provided the concentrations are modified by the influence of the mean molecular velocities and the shape of the molecules. The adsorption data for the following gases were used: CO2, N2O, HCl, H2S, NH3, Cl2, CH3Cl, SO2, CH4, and COCl2.

05613 151

Levine, M., W. F. Hamilton, and E. Simon

ATMOSPHERIC PHOTOCHEMICAL REACTIONS OF HALOGENS AND BUTYL HALIDES. J. Air Pollution Control Assoc., 14(6):220-223, June 1964. (Presented at the 56th Annual Meeting, Air Pollution Control Assoc., Detroit, Mich., June 9-13, 1963.)

This investigation was oriented toward delineation of the interactions involved in the chemical inhibition of smog exhibited by iodine and to a much lesser extent by the other halogens. Apparatur used for handling and irradiating polluted atmospheric air was a 500 cu ft chamber enclosed by a "Mylar" polyester film 1 ml thick. The chamber is mounted on large casters allowing positioning of the unit for optimum sunlight exposure. When thermal (dark) reactions are studied, the entire chamber is rolled into a large, light tight, thermostatically controlled oven. Other details concerning the laboratory procedure are given. The results of these tests show that neither temperature, over the range of about 100 to 200 F, nor sunlight greatly influences the reaction ratio of O3 with iodine 2, and that sunlight has a much greater effect on the reaction rates of the halogens with O3 than does temperature. The qualitative rates of halogen-ozone reactions in purified air in sunlight are iodine 2 greater than Br2 greater than Cl2. The effectiveness of iodine 2 in reducing O3 in a smoggy atmosphere is enhanced over its effect on O3 in purified air, whereas the effectiveness of Br2 and Cl2 in quenching smog O3 is diminished. The effectiveness of Br2 in reducing O3 is inhibited by the presence of both saturated and unsaturated hydrocarbons, whereas the iodine 2 - O3 reaction is unaffected.##

C4654 152

S. E. A. McCallan and F. R. Weedon

TOXICITY OF AMMONIA, CHLORINE, HYDROGEN CYANIDE, HYDROGEN SULPHIDE, AND SULPHUR DIOXIDE GASES. II. FUNGI AND BACTERIA. Contrib. Boyce Thompson Inst. 11, (5) 331-42, Dec. 1940

Young actively growing cultures, on appropriate media, of 8 plant pathogens, namely Sclerotinia fructicola, Ceratostomella ulmi, Glomerella cingulata, Macrosporium sarcinaeforme, Pestalotia stellata, Botrytis sp. (cinerea type), Rhizoctonia tuliparum, and Sclerotium delphinii, and of 2 animal pathogenes, Monilia albicans and Escherichia coli, were exposed to a continuous flow of SO_2, Cl_2, NH_3, H_2S, and HCN gases under controlled conditions. Exposures were made for 1, 4, 15, 60, 240, and 960 minutes at concentrations of 1, 4, 16, 63, 250, and 1000 p.p.m. After exposure the presence or absence of growth on fresh sterile media was noted. Sclerotia of Botrytis sp. (cinerea type), Rhizoctonia tuliparum, and Sclerotium delphinii were likewise tested. A reciprocal relation between time and concentration for a given response was noted. SO_2 or Cl_2 was the most toxic gas toward the cultures, NH_3 was intermediate, and H_2S and HCN the least toxic. There was no significant difference in the response of the animal as compared to the plant pathogenes. Sclerotium delphinii and Rhizoctonia tuliparum were the most sensitive cultures and Ceratostomella ulmi and Escherichia coli the least sensitive. The sclerotia were more resistant to the gases than the cultures. Young cultures and sclerotia are more sensitive than older ones. With all plant pathogenes, and all gases, there was a conspicuous delay in the visible growth of viable cultures after transferring to fresh media. In the case of the sclerotia there was an increase in the percent viable after 30 days. Exposing the culture media to SO_2 and Cl_2 resulted in a decided increase in acidity, while in the case of NH_3 the media became much more alkaline. This indirect effect may account for the partial toxicity of the gases, but in general it is believed that the effect is a direct one. (Author summary)**

21597 153

Morris, E. D., Jr. and Harold S. Johnston

ULTRAVIOLET SPECTRUM OF THE ClOO RADICAL. J. Am. Chem. Soc., 90(7):1918-1920, March 27, 1968. 7 refs.

Chlorine at 1.8 torr in the presence of 1 atm of oxygen was photolyzed by fluorescent lamps flashing in a square-wave mode at 1 cps. A modulation spectrum was observed between 2250 and 2900 A. A small negative phase around 2300 and 2400 A represents a fast intermediate, while the larger negative angle around 2800 A indicates a slow intermediate which was identified as ClO. A spectrum of the fast intermediate with minimum interference from ClC was obtained directly at 40 cps and another was obtained by decomposing the 0.25-cps spectrum. Both methods were in good agreement. The fast intermediate was identified as the radical ClCO.

15496 154

Prokop'yeva, M. P. and V. K. Rukina

SELECTION AND TESTING OF SOLID CARRIERS IN THE CHROMATOGRAPHY OF CORROSIVE INORGANIC GASES. (Podbor i ispytaniye tverdykh nositeley v khromatografii agressivnykh neorganicheskikh gazov). Text in Russian. Uzbeksk. Khim. Zh., no. 4:51-53, 1967. 4 refs.

Studies were made with pumice, quartz, zeolite, porous teflon, Estonian mineral carriers K1 and K2, diatomaceous brick and, kieselguhr. The brick, kieselguhr, pumice, and quartz were subjected to boiling with hydrochloric acid (1:1) for 6 hrs. After washing to remove chloride ion, they were heated for 2-3 hrs at 900 C (pumice at 400 C). The other carriers were not pretreated. The criterion for inertness of the carrier was the retention time of the gaseous component relative to that of air. Distortion of the absorption isotherm was evaluated in terms of the Kestner coefficient of asymmetry. Pretreated brick, kieselguhr, and pumice revealed linear absorption isotherms for all components (CO_2, Cl_2, NOCl, HCl, SO_2) with the exception of NO_2, which is irreversibly absorbed. Teflon, K1, and K2 show linear absorption curves without preliminary treatment and are recommended for the analysis of gas mixtures containing NO_2.

NOT REPRODUCIBLE

15869 155

Reed, Cortes F.

METHOD OF REACTING AROMATIC HYDROCARBONS. (Charles L. Horn, Minneapolis, Minn.) U. S. Pat. 2,174,111. 2p., Sept. 26, 1939. (Appl. May 25, 1936, 6 claims).

A method of forming benzene derivatives directly in the presence of an oxide of sulfur, tellurium, and selenium, while controlling the temperature of the reaction to prevent polymerization, is described. The method also provides a means of preparing chlorobenzene substitution products, particularly chlorobenzenes which give a high yield and require a minimum number of steps in its preparation. The method consists of reacting an aromatic hydrocarbon with a vapor mixture of chlorine and an oxide of sulfur, selenium, or tellurium at room temperature. The temperature of the reaction is limited to 70 C. The passage of the mixture into the reaction medium is continued until crystalline products are precipitated.

15266 156

Rozenberg, Jean

PHOTOCHEMICAL SEPARATION OF ISOTOPES. Isotop. Radiat. Technol., 3(3):200-205, Spring 1966. 57 refs.

Experiments in the photochemical separation of isotopes are reviewed, and the technique is shown to be especially applicable to mercury isotopes. Good separation requires that the bands in the absorption spectrum of the element be widely separated and that the product enriched by photoselective reaction not be contaminated by secondary reactions. Separation of mercury isotopes is a well-developed procedure and is about to become industrial. Lithium isotopes should theoretically be separable by such a technique, but handling of molten lithium is difficult. The failure of the first attempts to separate chlorine and uranium isotopes is probably due to misjudgment of the primary mechanisms and to the use of too simple techniques. Hydrogen isotopes may be separated with light sources with H (or D) alpha Lyman sources, but yields are too low for large-scale use. (Author abstract modified)

14241 157

Ruthven, D. M. and C. N. Kenney

EQUILIBRIUM CHLORINE PRESSURES OVER CUPRIC CHLORIDE MELTS. J. Inorg. Nucl. Chem., 30(4):931-944, 1968. 32 refs.

Equilibrium chlorine vapor pressure measurements are given for the liquid systems CuCl2-CuCl, CuCl2-CuCl-KCl, CuCl2-CuCl-KCl-LaCl3, and CuCl2-CuCl-ZnCl2 and are discussed in relation to phase diagrams and other published thermodynamic data. The measurements, which were made as part of a study of the Deacon reaction over molten halide salts, indicate that the liquid systems CuCl2-CuCl and CuCl2-CuCl-ZnCl2 behave as approximately ideal solutions. The systems involving potassium chloride are more complex, as nonideal entropies of mixing are involved. The addition of potassium chloride to the binary liquid system CuCl2-CuCl leads to a negative excess entropy for the reaction CuCl2 yields CuCl plus 1/2Cl2, and since there is little evidence of a nonideal entropy effect due to potassium-cuprous interaction, it is inferred that the partial molar entropy of cupric chloride in the ternary system CuCl2-CuCl-KCL is greater than in the binary system CuCl2-CuCl. The behavior of the systems containing lithium or sodium in the place of potassium are broadly similar, although the magnitude of the effects are smaller. Addition of lanthanum chloride has no significant effect on equilibrium chlorine pressure, nor does the presence of zinc chloride cause marked deviations in enthalpy and entropy values.

13565

158

Sanderson, R. T.

MULTIPLE AND SINGLE BOND ENERGIES IN INORGANIC MOLECULES. J. Inorg. Nucl. Chem., 30(2):375-393, Feb. 1968. 7 refs.

The new method of calculating bond energies recently reported (R. T. Sanderson, J. Inorg. Nucl. Chem., vol. 28:1553, 1966) has now been extended to include multiple bonds. For carbon-carbon double and triple bonds the energy is 1.50 and 1.75 times the single bond energy when corrected for the multiple bond length. These multiplicity factors are used to calculate the single bond energies for nitrogen and oxygen that would correspond to the experimental bond lengths and dissociation energies of N2 and O2. Three different single bond energy contributions each for nitrogen and oxygen are thus determined, and estimates are made for similar values for fluorine, phosphorus, sulfur, chlorine, bromine, and iodine. The possible significance of such values is discussed in terms of bond energy calculations for 141 gaseous molecules, based on a consideration of the effect of lone pair electrons in bond weakening. Calculated bond energies for CO, CO2, NO, NO2, and other compounds are in excellent agreement with the experimental values. (Author's abstract modified)

17962

159

Smeykal, Karl and Rudolf Kuehn

METHOD FOR THE PRODUCTION OF ORGANIC SULFUR COMPOUNDS. (Verfahren zur Herstellung von organischen Schwefelverbindungen). Text in German. (Farbenindustrie (I. G.) A.-G., Frankfurt, Germany) W. Germany Pat. 721, 892. 2p., July 5, 1939. (2 claims).

New organic sulfur compounds are obtained by conversion of sulfochlorides with mercaptan compounds. The sulfochlorides are obtained by simultaneous reaction of chlorine and sulfur dioxide with saturated aliphatic hydrocarbons. They contain oxygen, sulfur, and chlorine. An acid binding agent is necessary for the process. As mercaptan compounds, methyl mercaptan, ethyl/mercaptan, as well as high molecular mercaptans can be used. As an acid binding agent, dry ammonia is used in gaseous form. Two practical examples are given. In the first case, 100 parts of oxygen, chlorine, and sulfur containing product is mixed with 29 parts of tertiary butyl/mercaptan. Gaseous ammonia is entered into the mixture which is constantly agitated. The temperature of the mixture must not rise above 30 C. The precipitated ammonium chloride is dissolved in water; the oil layer is separated. In the second example, 100 parts of oxygen, chlorine, and sulfur containing product are dropped into a mixture of 30.8 parts of propyl/mercaptan and 100 parts of 20% aqueous sodium lye. The oil obtained in both cases is suitable for softening polyvinyl chloride.

160

14541

Stephens, F. J. and G. A. Morris

DETERMINATION OF LIQUID-FILM ABSORPTION COEFFICIENTS. Chem. Eng. Progr., 47(5):232-242, May 1951. 14 refs.

A new type of laboratory absorption column is described which is suitable for the determination of liquid-film transfer coefficients when reliable data on rates of diffusion are not available. This gives results for physical solution similar to those obtained in packed towers. If the relative performance of the laboratory column and various packings is established first for a known system (such as carbon dioxide-water) it is possible to predict the liquid-film coefficient for other systems with these packings by means of laboratory experiments. This procedure has the advantage of avoiding use of large quantities of gas and liquid necessary for experiments on a semitechnical scale. It is particularly convenient when it is required to determine absorption coefficients for systems which involve chemical reaction in the liquid. An account is given of experiments on the absorption of chlorine from mixtures with air into an aqueous liquor containing ferrous and ferric chlorides (initial composition 23.5 lbs FeCl2/cu ft; final composition 28.7 lbs FeCl3/cu ft) using this type of column. A correlation is presented covering the effects of liquid rate, concentration of unconverted ferrous chloride, and partial pressure of chlorine in the gas. It is shown that the results are consistent with the assumptions that a rapid reaction takes place in a narrow zone within the liquid film, and the rate of absorption is controlled by the rates of diffusion of the reactants. The correlation should not, however, be applied to weaker liquors of substantially lower viscosity. (Author abstract modified)

NOT REPRODUCIBLE

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16572

Sugiyana, Kozo and Takehito Takahashi

PRODUCTION OF CHLORIDE GAS BY OXIDIZING POTASSIUM CHLORIDE AND SULFUR WITH PYRITE. (Enka-kariumu, pairaito oyobi yuo no sanka ni yoru enso seisei hanno). Text in Japanese. Kogyo Kagaku Zasshi (J. Chem. Soc. Japan), 68(3):433-437, 1965. 9 refs.

In the production of chloride (Cl2) by oxidizing KCl and S, the addition of pyrite (FeS2) increased the reaction velocity by maintaining a high temperature; it also increased the sulfur source as FeS2 and produced Fe3(SO4)3 as a catalyzer to oxidize SO2. The pyrite included 42.4% Fe and 42.9% S. The KCL and S were placed in a quartz cylinder, the internal volume of which was 212 cu cm, and oxygen gas was sent into this cylinder to oxidize materials, after which the materials were heated by an electric hearth at 500 to 800 C. The higher temperature showed larger reaction velocity (the reaction velocity at 700 C was twice as much as that at 500 C). There was little influence of the particle sizes of KCl and FeS2 on the production of Cl2.

The reaction increased rapidly between 70 to 100 minutes after it began. The amount of sulfur to produce Cl_2 was maximum when the weight ratio between pyrite and S was one to one, and it increased with the small amount of material compound when the compound had a definite weight ratio of KCl, S, and pyrite. Eventually the production ratio of Cl_2 from KCl was 55 to 80% when the weight ratio of pyrite to KCl was 10 to 30%, the reaction temperature was 600 to 700 C, and the reaction time was 2 to 3 hours. This process produced $K_3Fe(SO_4)_3$ and a mixture of $K_3Fe(SO_4)_3$ and KCl, as determined by roentgenological analysis of rapidly frozen intermediate products.

18572 162

Tikhonov, A. I. and I. P. Sevryalin

THERMODYNAMICS OF THE BASIC REACTIONS OF CHLORINATION ROASTING. (Termodinamika osnovnykh reaktsiy khloriruyushchego obzhiga). Text in Russian. Tr. Ural'sk. Politekhn. Inst., no. 99:33-40, 1960. 11 refs.

Results from thermodynamic calculations of the most important reactions of chlorination roasting over the range 573-973 C are presented. These reactions may be represented for the metals Na, Fe, Co, Ni, and Cu by the generalized formulas: Me plus Cl_2 yields $MeCl_2$; 2MeS plus $2Cl_2$ yields $2MeCl_2$ plus S_2; 2MeO plus $2Cl_2$ yields $2MeCl_2$ plus O_2 and its reverse; MeO plus C plus Cl_2 yields $MeCl_2$ plus CO; MeO plus CO plus Cl_2 yields $MeCl_2$ plus CO_2; MeS plus $2O_2$ yields $MeSO_4$; and $MeSO_4$ plus 2NaCl yields Na_2SO_4 plus $MeCl_2$. The values for standard isobaric potential and equilibrium constants tabulated were derived from data taken from both U. S. and USSR sources and may be used to study the mechanism of the process and to select process conditions.

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